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ART. XXXVIII.—ON PRECIPITATED CARBONATE OF LIME.

BY ROBERT BRIDGES, M. D.

THE precipitated carbonate of lime, which is an officinal preparation of the Dublin Pharmacopœia, has of late found much favor with some physicians, as capable of producing a mixture superior to the prepared chalk, in being more free from grit. The preparation most esteemed is the imported article, an opinion having been expressed, that the preparation as generally manufactured here, is not superior in its state of division to the ordinary prepared chalk. As the article is modified very essentially as to its pulverulent state by the mode of its production, the following observations may not be irrelevant at the present time.

The circumstances modifying the minuteness of the divisions may be comprised under three heads—viz :

1. Density of the solutions used.
2. Nature of the compounds used to produce the double decomposition.
3. The temperature at which the precipitate takes place.

It may be premised that under all circumstances of precipitation, carbonate of lime has a strong tendency to assume a crystalline form and structure, as is very manifest in stalactital concretions, which are generally formed by the precipitation of carbonate of lime from its solution in water by means of carbonic acid. The same structure is also produced, on mixing a solution of lime with any soluble carbonate—although in some instances it may require a high magnifying power to detect the crystalline form.

1. Density of the solutions which are used in the precipitation, produces the least effect of the three circumstances noticed; but it may be stated, that very strong produce a finer precipitate than very weak solutions—probably in consequence of the density causing a more rapid formation of the carbonate—and hence, less time is afforded for the concretion of the particles in crystallizing.

2. The nature of the compounds used to effect precipitation produces more manifest effects. With respect to the lime compound, the variation is not very great. Acetate of lime, however, produces a precipitate more divided than chloride of calcium. With respect to the precipitant the choice is more important. Carbonate of potassa is totally unfit to procure a good pharmaceutical preparation. It produces a precipitate which is coarse and gritty, being constituted of crystalline grains of such magnitude, that the carbonate thus made presents the appearance of fine sand; when dry, the particles cohering very slightly either to each other, or the containing vessel, so as readily to roll over, on every change of position. The crystalline structure is here manifest through a magnifier of no great power.

Carbonate of soda and carbonate of ammonia, afford a better preparation; the precipitate being more divided, but still possessing some of the above noticed sabulous characters—not, however, so very manifest as in the preceding case. The size of the particles may still be detected by the tongue, which affords the most sensitive surface for the perception of grit.

3. The temperature at which the precipitate forms, is very material to the resulting fineness of the precipitated carbonate. The preceding remarks apply to common temperatures, the precipitate increasing in minuteness of division with the rise of temperature, and when boiling solutions are used, loses entirely the sandy character. The precipitate then formed is smooth, and perfectly without roughness, even when placed on the tongue, and the particles

now cohere when dry, both to each other and the containing vessel, as is usual with fine powders.

This difference is due to the dimorphous character of carbonate of lime, and the influence of temperature in bringing out and rendering this condition manifest. At low temperatures the ordinary form of crystal, viz., that of rhomb spar (the regular rhombohedron) is produced; but at high temperatures, the more rare configuration of arragonite, (six-sided prism,) is the result. The former occurring in nature, always of manifest size; the latter generally in minute crystals.

From the above remarks it must be evident, that the Dublin formula should afford a tolerably good pharmaceutical preparation, although it does not combine all the circumstances necessary for the best result. In this formula a strong solution of chloride of calcium (Ca Cl 2 parts, to aq. 7 parts,) is precipitated by a strong solution of carbonate of soda, (NaO<sub>CO</sub><sub>2</sub> 3 parts, to aq. 12 parts,) but no reference is made to temperature, hence ordinary temperatures are to be understood; and the result is, that although the particles of the powder are very small, yet some degree of grit may be detected by the tongue. The article imported into this city, may be presumed to be formed by this process, as it cannot be distinguished by any character from that prepared according to these directions. To produce the best preparation it is only necessary to modify this process by using boiling solutions, to produce a precipitate as minutely divided as may be desired, and in which no grit can be detected.

## ART. XXXIX.—REPORT ON CATECHU.

THE Committee to whom was referred for examination a specimen of Catechu, after due investigation, offer the following Report:

The specimen in question was obtained from the extensive drug warehouse of the Messrs. Lennig of this city, where it is found in large quantities, having been imported by them under the name of *Terra Japonica*, from England, for the use of calico dyers in this country. It is very little known in our market, and is now for the first time brought under the notice of our apothecaries. It is brought from Singapore to Liverpool, where it goes under the name of *cutch*, in large masses weighing 150 lbs., covered over with palm leaves, and encircled by a kind of basket formed of strips of cane.

The breaking open of one of these bags presents to view masses of irregular cubical blocks, whose sides average an inch square, and adhering together from being packed when imperfectly dried. It is of a deep yellow or cinnamon color internally, mingled occasionally with spots of white—and reddish brown externally. This dark color is interspersed throughout the mass, upon the division line of the cubes.

It is inodorous, has a powerfully astringent, somewhat bitter, and a subsequent sweetish taste; is very friable, and presents a dull earthy surface when broken. Though presenting an amylicious aspect, the presence of starch is not revealed by the usual test. Its lightness is such as to enable it to float upon water. Heated, it softens, swells up, and when consumed leaves but little ashes.

It is almost wholly soluble in cold water, 7-8ths of substance being taken up by displacement with this menstruum, furnishing by evaporation a translucent dark extract.

It completely dissolves in hot water, from which, upon cooling, no inconsiderable portion of *catechine* is deposited from the thin turbid liquor. 240 parts of this Catechu treated with rectified alcohol by displacement, yields upon evaporation, 220 parts of extract, of which 96 per cent is soluble in water. The marc after displacement with alcohol, dried and treated with water, furnished 10 parts extract. Sulphuric ether takes up 35 per cent. of soluble matter, forming with it a beautiful deep red tincture: the insoluble portion is black, tough and elastic.

From a comparison of the above descriptive analysis, with the article of *Gambir Catechu* mentioned in the U. S. Dispensatory, p. 194, as also Pereira's *Materia Medica*, vol. 2d, they will be perceived to be identical. Though supposed to be an inferior quality of an officinal Catechu, ranged under the head of *Catechu in quadrangular cakes*, a material difference will be perceived to exist in the character of the two varieties. Gambir, is preferred in the arts, not merely from its low price, but according to the representation of dyers, as being richer in the astringent principle. Experiments upon it prove the proportion of tannin to be large, consisting chiefly of this, with apotheme, or the peculiar extractive and catechine. From the difficulty of separating the compound of tannin and gelatine, a method given by Berzelius, to appreciate the quantity of tannin contained in Catechu, was resorted to. It is this:

"Dissolve out with water the soluble matter of catechu, filter and add sulphuric acid, which occasions a slight precipitate, which you separate by filtration: afterwards pour into the clear solution concentrated sulphuric acid, until it no longer precipitates. Gather the precipitate upon a strainer, wash with sulphuric acid diluted to about the degree of the filtered liquid, and place the strainer between bibulous paper to extract the moisture. Then dissolve in boiling water, and suffer the solution to cool. A compound of sulphuric acid and apotheme is deposited; filter and mix

the orange colored solution with finely powdered carbonate of lead in small quantities at a time, and as long as its addition occasions effervescence. Allow a slight excess of lead, sufficient to prevent chloride of barium forming a precipitate with the filtered solution. At this point filter and evaporate *in vacuo*. The resulting tannin will be in the form of a transparent, yellow, coherent mass, readily soluble in water,—but if evaporated in contact with the air, it will be of a deep red color, and not so completely soluble."

This method enabled us to procure, allowing for some loss—about 40 per cent. of tannin. This, however, is believed to be an undervaluation.

As an article of medicinal worth, we believe Gambir Catechu, by reason of its great astringency, and the amount of soluble extract furnished by it, to be equal, if not superior to a number of the astringent extracts ranked as Officinal Catechu, and consequently deserving a place in the shop of the apothecary.

AUGUSTINE DUHAMEL,  
JOHN H. ECKY,  
WM. PROCTOR, JR. } Committee

June, 1814.

**ART. XL.—ON THE PREPARATION OF PERCHLORIDE OF IRON.**

THE sesquichloride or perchloride of iron exists in the anhydrous state and in the state of hydrate.

There are two processes for obtaining the anhydrous salt. The first consists in putting iron filings into a luted glass or porcelain tube, placed in a furnace, the tube being sufficiently long to project some distance beyond the furnace, and the iron being kept in that part of the tube directly exposed to the heat. When the apparatus has been thus arranged, the tube is heated to a temperature below that of red heat, about  $752^{\circ}$  Fahr., and then a current of dry chlorine is made to enter at one end of the tube. The chlorine is rapidly absorbed, the iron becoming incandescent, while copious vapors of sesquichloride are formed, which condense in the form of scales, having a violet color and metallic lustre in the cool part of the tube.

The second process consists in saturating commercial hydrochloric acid with hydrated peroxide of iron, either in the dry or moist state. The solution is commenced without heat; it is afterwards continued with the aid of a gentle heat: when the acid ceases to dissolve any more oxide, the liquor is filtered and evaporated to dryness in a porcelain capsule, taking care to moderate the heat and to stir constantly. The product of this operation is introduced into an earthen retort, and heated gradually, taking care not to apply any fire to the dome of the retort. Aqueous vapors are first disengaged; when these cease to appear, a cork is loosely fitted to the mouth of the retort, and the heat is then increased until the bottom of the retort becomes nearly red hot towards the close of the operation. The anhydrous perchloride sublimes on to the dome and into the neck of

the retort, which is to be broken when cold, and the salt immediately enclosed in bottles.

Although the second of these two processes is the better and more easy of execution, yet many pharmaceutists would find a difficulty in preparing it; moreover, the Codex orders as the medicinal perchloride of iron that which is prepared by the moist way.

Several processes have been proposed for making the hydrated perchloride of iron, which I will describe.

The Codex orders the red oxide of iron to be dissolved in hydrochloric acid, and the solution evaporated to dryness in a water-bath. This process is a bad one; because, however carefully it may be evaporated, the product always contains a large proportion of insoluble oxychloride.

MM. Thénard, Berzelius, and Orfila recommend in their works to prepare it by dissolving sesquioxide of iron in hydrochloric acid, evaporating the solution to the consistence of syrup, and allowing it to cool. The perchloride is deposited in fine red crystals, which are very deliquescent.

M. Béral has proposed to prepare it by dissolving precipitated sesquioxide of iron in hydrochloric acid, first without heat, and then with the heat of a water-bath; the solution is transferred to a porcelain capsule, and evaporated at a gentle heat to the consistence of syrup. When it has arrived at this point, the capsule containing the perchloride of iron is placed by the side of another capsule, containing caustic potash or lime, and the whole covered by a bell-glass. The alkali absorbs the water and hydrochloric acid, so that in ten or fifteen days the chloride becomes a dry, imperfectly crystallized mass. To keep the salt dry, it should be at once put into a bottle, before it becomes affected by the external air. This method answers very well, but it has the disadvantages of requiring a good deal of time, and affording a chloride which is not always uniform in composition, as it contains variable proportions of water, owing to the method adopted in its preparation.

M. Mohr has recently proposed to prepare the perchloride of iron by dissolving haematite by digestion in commercial hydrochloric acid, and boiling the mixture towards the end of the operation. The liquor is allowed to become clear, is then evaporated to the consistence of a syrup, and afterwards exposed in a covered vessel, in a cold place, such as a cellar, where after a few days it begins to crystallize, and continues to do so for several weeks. The mother-water is decanted, and the crystals preserved.

M. Mohr analysed the chloride prepared in this way, and found it to contain twelve atoms of water. He has therefore assigned to it the formula  $\text{Fe}_2 \text{Cl}_3 + 12 \text{H}_2\text{O}$ .

M. Fristche, who undertook a fresh investigation to determine the proportion of water contained in Mohr's chloride, found that the analysis of this chloride (and the same is also true of those prepared according to the processes of Orfila, Thénard, and Berzelius) affords very variable results with reference to the proportion of water, so that it is impossible to say whether it contains 10, 11, or 12 atoms of water. With 10 atoms it should contain 35.92 per cent., with 11, 38.15, and with 12, 40.22.

According to the same chemist, if the preceding chloride be left under a bell-glass with sulphuric acid, the crystals are again reduced to the state of a thick liquid, from which fresh crystals are formed, containing from 21 to 23 per cent. of water. If they contained 5 atoms of water, there would be 21.9 per cent. These same crystals may also be obtained, according to M. Fristche, by fusing the chloride with 10, 11, or 12 atoms of water, evaporating so that a drop will solidify on cooling, and adding a few drops of concentrated hydrochloric acid before putting it to cool.

M. Fristche has been led by his researches to admit the existence of two hydrates of perchloride of iron perfectly crystallizable, between which there is no crystallizable combination.

As will be seen, many processes have been given for the

preparation of hydrated perchloride of iron, but none of these are adapted for obtaining it readily, of uniform composition, entirely soluble, and susceptible of long preservation. The principal cause of the easy alteration which the chloride of iron undergoes when prepared by either of the processes described above, seems to be the large quantity of water which it retains. Thus, that of M. Béral, which contains the least, affords, soon after its preparation, a perceptible deposit of oxychloride, when dissolved in water.

Induced by M. Soubeiran to seek a practical process for obtaining, in a short time, a perfectly soluble perchloride of iron, of a sufficiently uniform composition to admit of its strength being easily estimated, I believe I have succeeded, by submitting a solution of sesquioxide of iron in hydrochloric acid to evaporation under the two following conditions: first, evaporation at a temperature not exceeding  $212^{\circ}$  Fahr.; secondly, evaporation in perfectly dry air.

After several experiments, the following is the process at which I have stopped:—Take of haematite, that which mineralogists denominate concrete red oxide of iron, (*fer oxydé rouge concrétionné*,) reduced to powder by pounding and triturating in small quantities at a time in an iron mortar; introduce this into a stoppered bottle, and add to it pure concentrated hydrochloric acid in such quantity that there shall be an excess of haematite; then agitate the mixture. The two bodies soon react upon each other, producing water and perchloride of iron, accompanied with the disengagement of heat. This first action having subsided, place the bottle near the fire, and shake it from time to time. After remaining in contact for several hours, allow it to deposit, and then filter the solution. The filtered liquor is received in a porcelain capsule, which is placed either on sand heated by steam, or over the mouth of a cucurbit, taking care to interpose a piece of flannel between the capsule and the cucurbit, which should be tied on to keep it in its place. The apparatus should be so arranged that the

vapor may be all condensed by means of a proper refrigerator, as it is essential to the success of the process that no steam should circulate around the capsule, for if the liquor be evaporated in air charged with moisture, it undergoes decomposition at a certain point of concentration, hydrochloric acid being disengaged, and sesquioxide of iron precipitated. It should be stirred with a glass spatula during the whole time of evaporation, which must be continued until the liquid no longer disengages any sensible vapors of hydrochloric acid, and a drop solidifies on cooling. When it has arrived at this point, the chloride is poured into perfectly dry bottles furnished with good corks; but as the salt on cooling becomes very hard, it is difficult to get it out of the bottles, to obviate which inconvenience, M. Soubeiran, who repeated the process, very judiciously recommended to pour it into a plate which has been slightly greased, and immediately to cover it with another plate, and lute the two together. After about twenty-four hours, the plates are to be separated, the chloride broken, and immediately introduced into well-stoppered bottles.

The perchloride of iron thus prepared possesses a dark yellowish-red color, no smell, and a very styptic taste. It is very soluble in water; the solution, which is of a fine golden-yellow color, keeps for an indefinite time exposed to the air without becoming turbid. It is also very soluble in alcohol and in ether.

Exposed to the air, it rapidly absorbs moisture, which it at first solidifies, but it soon afterwards deliquesces, so that it is necessary to keep it in dry well-stoppered bottles.

This chloride possesses the great advantage of keeping a long time without undergoing decomposition, owing, no doubt, to the small quantity of water which it contains. Thus the specimen which I possess is now, eight months after its preparation, in the same state as when first prepared.

To determine the quantity of water which it contains, I

took four specimens of the chloride, one of which had been prepared by M. Soubeiran, and the other three by myself. One gramme of each was decomposed by a gentle heat, and the decomposition assisted by the addition, from time to time, of a few drops of nitric acid. The four specimens afforded products of sesquioxide of iron very nearly the same. That prepared by M. Soubeiran afforded 0.393, and the three others, 0.392, 0.385, and 0.380. The mean of these four quantities is 3.875, which represents 26.86 per cent. of iron. But 26.86 of iron requires 52.58 of chlorine to form sesquichloride, so that it follows that 100 parts of the chloride consist of

Iron, -	-	-	-	-	-	26.86
Chlorine, -	-	-	-	-	-	52.58
Water, -	-	-	-	-	-	20.56
<hr/>						100.00

This chloride contains about one-fifth of its weight of water, or rather less than five atoms, for five atoms would be in the proportion of 21.9 per cent. It corresponds with the hydrate, containing five atoms of water, of M. Fristche.

The process that I propose has, then, the great advantage of affording a chloride entirely soluble, which has a composition sensibly uniform, and which may be kept for a long time, objects which have not hitherto been attained.

*Pharmaceutical Journal, from Journal de Pharmacie.*

## ART. XLI.—ON THE CHLORIDE OF GOLD. By M. LEVAL.

MUCH difficulty has hitherto been experienced in obtaining the red and yellow salts of gold, so as to be perfectly soluble in water, and without reduction. After numerous experiments, I have succeeded in preparing these salts in a manner which appears to me to be unexceptionable.

M. Leval has published in the *Journal de Pharmacie* a good process for obtaining pure gold by means of protocloride of antimony; that which I have used in my experiments has been obtained by this method:—

First, To prepare the yellow salt of gold, *aqua regia*, formed of three parts of hydrochloric acid, one part of nitric acid, and one part of distilled water, should be used. Put one part of pure gold into a porcelain capsule; and pour over it *aqua regia*, prepared as above; the quantity of acid being double that of the gold employed. Cover the capsule with a plate of glass, and place it on a water-bath, made with a saturated solution of salt; continue the application of heat, taking care to keep the capsule always covered, until the evolution of nitrous vapors has ceased. If the whole of the gold is not dissolved, add a little more *aqua regia*, cover the capsule again as before, and continue the application of heat until the vapors no longer appear. The plate of glass should now be raised and kept up by a piece of folded blotting-paper, and evaporation continued over the water bath, until, on introducing a glass rod into the capsule, and withdrawing it, the chloride of gold, which adheres, on cooling becomes solid. Remove now the capsule from the water-bath, and the chloride will soon crystallize in small prismatic needles, of a fine yellow color, approaching to orange.

The chloride obtained in this manner is entirely soluble in water, and without reduction. It is employed with much

success in fixing the Daguerreotype images, and for many other purposes.

The red chloride of gold (terchloride) is prepared in the same manner; only the *aqua regia* employed is made with two parts of hydrochloric acid, and one part of nitric acid. The gold is first treated with excess of *aqua regia*, on a sand-bath, and the water-bath is not employed until the metal is entirely dissolved. In other respects the operation is conducted in the same way as in the preparation of the yellow chloride.

*Ibid, from Ibid.*

#### ART. XLII.—ON THE PREPARATION OF PHARMACEUTICAL EXTRACTS.

BY M. BURIN.

In a work which I hope soon to publish, I have treated of the preparation of extracts in a series of articles, which, considered collectively, are founded on the following principles:—

1st. A vegetable substance being given, to endeavor to ascertain to which of its chemical constituents its medicinal activity should be ascribed.

2d. The active constituents being known, to study their chemical characters, in order to determine, among other things, the solvents which ought to be employed for separating these from such as are inert, and which on that account may prevent the preservation of the product, or destroy the energy of its properties.

3d. To effect the evaporation of the liquid employed as a vehicle, in such a way as to avoid completely the decom-

posing action which organic bodies so readily undergo in contact with chemical agents, such as heat, air, and water.

Based upon these principles, I will here give an explanation of the mode of operating which I adopt for the preparation of some extracts, selected from amongst those most frequently employed.

*Belladonna, Stramonium, Hyoscyamus.*

Most of the solanaceæ, and especially those named above, contain active principles, the chemical characters of which, and their action on the animal economy, are very similar.

In preparing the extracts of belladonna, stramonium, hyoscyamus, and some other solanaceæ, I take

The leaves and branches at the commencement of inflorescence,

Alcohol, sp. gr. 0.834, of each equal parts.

The plant is carefully crushed in a marble mortar, expressed with the hands, then again submitted to the action of the pestle. The juice obtained is added again to the plant, the alcohol is also added, and the whole allowed to macerate for six days. It is then thrown on to a strainer, and the marc submitted to the action of a powerful press. The liquors being put together and filtered, are distilled *in vacuo*, if possible, or otherwise over a water-bath, to recover the alcohol. In distilling over a water-bath, no alteration takes place in the product, as it is not exposed to the influence of the air. The residue is allowed to cool, and is afterwards filtered to separate the chlorophyle which is precipitated; it is now evaporated *in vacuo*, or if the necessary apparatus is not attainable, the product is put out, to the thickness of four-fifths of an inch, in large tin moulds, the surfaces of which have been rubbed with quicksilver, and left to spontaneous evaporation in a stove having a constant current of air heated from 95° to 104° Fahr. When the extract has acquired the consistence of honey, it is again

dissolved in three times its weight of spirit, sp. gr. 0.834. It is then filtered, distilled over a water-bath to recover two-thirds of the spirit, and the evaporation completed in the stove.

The product should be preserved in closely stoppered bottles.

The object of dissolving the hydro-alcoholic extract in concentrated spirit, is to separate a certain quantity of salts which are soluble in weak spirit, and also the inert coloring matter. This method, however, is not new ; it has, in fact, been already applied by M. Dublanc in the preparation of extract of lettuce, and by M. Lombard for extract of aconite ; finally, Messrs. Georges and Hespe have recommended its adoption in preparing the aqueous extracts of *hyoscyamus* and other solanaceæ from the dry plant.

The extracts of these three plants, prepared as above described, have a purpleish yellow color when viewed in thin layers ; they possess the peculiar odors of the plants, have at first an acrid taste, afterwards the mouth becomes dry and clammy, with a feeling of constriction at the back of the throat, which is accompanied with an effect on the brain similar to that caused by a small quantity of tobacco smoke to a person not accustomed to it.

They powerfully dilate the pupil of the eye.

One part of the extract represents the principle soluble in water and in alcohol, of

88 parts of fresh Belladonna, or 12 parts of Powder.

110        "        Stramonium, or 12        "

155        "        Hyoscyamus, or 16        "

It is composed of yellow extractive, a complex body which retains a certain quantity of odorous volatile oil, and the whole of the crystallizable alkaline matter, or poisonous and medicinal principle of the plant, which is in a state of preservation that may be considered as perfectly normal, all chances of alteration that might have resulted,

either from the mode of operation or during the evaporation, being avoided almost entirely.

These extracts ought not to be employed excepting when specially directed by a medical man, and in no case should be substituted for those prepared in the ordinary way.

### *Extract of Gentian.*

The observations of MM. Planche, Henry, and Caventou, and of M. Leconte, have shown the presence of the following substances in gentian: *volatile odorous principle, gentisine, gluey matter, green oily matter, uncrystallizable sugar, gum, pectic acid, fawn-colored coloring matter, organic acid, and bitter extractive matter.*

MM. Henry and Caventou, extracted from gentian a crystalline matter, which they considered, under the name of *gentianine*, as the bitter principle of gentian; but this substance, *gentisine*, as has been shown by MM. Leconte and Trommsdorff, is nothing more than a pale yellow coloring matter, which crystallizes in long needles, tasteless and inodorous, which is mixed in the *gentianine* with variable proportions of the bitter principle and of fatty matter.

It results from these facts, that the chemical nature of the bitter substance of gentian has still to be determined; and, as will be seen, in the state in which it is now obtained, it exhibits the form of an uncrystallizable extractive matter, very soluble in alcohol.

Gentian, in coarse powder,  
Spirit, sp. gr. 0.834, aa, q. s.

The gentian is to be exhausted by Cadet's process, being treated three times successively with twice its weight of spirit. The liquors are put together and distilled over a water-bath to recover the spirit. The extract obtained is dissolved in distilled water, which takes up the bitter matter, the sugar, and the free acid, and leaves the fatty mat-

ter combined with the gentisine. It is filtered, and evaporation completed in the stove, and when the product has assumed the consistence of thick syrup, it is spread, by means of a brush, in thin layers over plates of tin, rubbed over first with quicksilver, and then with a cloth slightly moistened with oil of almonds. When the extract is dry, it is merely necessary to knock the back of the tin plate to detach it in beautiful yellow transparent laminæ, which should be preserved in well-stoppered bottles.

This extract, it will be observed, contains only the aromatic bitter matter of the gentian, the sugar, the free acid, and probably also a certain quantity of gentisine retained by the bitter principle. It represents the active principles of the gentian in a state of great concentration, and may form the basis of excellent preparations. One part of the extract is exactly equivalent to two parts of gentian root.

#### *Extract of Digitalis.*

As with gentian, three successive digestions with spirit, sp. gr. 0.834, entirely exhaust the digitalis of its bitter and odorous constituents. The liquors are mixed together; two or three litres of distilled water is added, or more, according to the quantity of matter under operation. The object of adding this water is to divide the chlorophyl, which otherwise carries down with it a considerable quantity of the active principles. It is then distilled over the water-bath to recover all the spirits, allowed to cool, and filtered to remove the chlorophyl. Proceeding afterwards in the same way as with the gentian, a dry extract is obtained in the form of fine transparent laminæ with very little color, but possessed in a high degree of the bitter taste and peculiar smell of digitalis. The smell becomes very perceptible on rubbing the extract, or moistening it with a little water. There can be no doubt that this extract is very energetic and preferable to all others; and that in the hands of an able practitioner it would form the basis of preparations possessing uniform medicinal activity.

One kilogramme (2.205 pounds) of digitalis, in powder, afforded me 108 grammes (1666.872 grains) of dry extract; but taking into consideration the inevitable losses in operating on larger quantities, it may be considered that one part of extract is equivalent to ten parts of the dry plant.

This extract should never be substituted for the ordinary extracts unless specially ordered.

### *Extract of Valerian.*

According to Trommsdorff's analysis, valerian root contains,

Volatile oil,	{	soluble in alcohol.
Resin,		
Peculiar volatile acid, (valerianic acid,) {	{	soluble in water.
Aqueous extractive,		
Peculiar substance,	{	soluble in water.
Starch,		

Experience has shown that the volatile oil, valerianic acid, and resin are essentially the active principles of valerian; on the other hand, the aqueous extract is not without action. It is desirable, therefore, to introduce into the product as large a proportion as possible of the three first substances, the solvent of which is concentrated alcohol, and also to admit a certain proportion of the constituents soluble in water.

The following is the mode of operating which I recommend :—

Valerian in coarse powder, Q. P. Carefully moisten this with twice its weight of spirit, sp. gr. 0.834. After being in contact for three days, introduce the mixture into an ordinary displacement apparatus, and displace the liquor by an equal weight of spirit, sp. gr. 0.915. The first product being distilled over the water-bath, the residue will be almost entirely composed of a dark green resin, holding in solution the whole of the volatile oil and valerianic acid. This product should be set aside in a well-stoppered bottle.

The spirit obtained by distillation is to be diluted with distilled water so as to reduce it to sp. gr. 0.915, and more spirit of this strength added, if necessary, to exhaust the valerian. All the liquors are to be mixed and filtered, and the spirit recovered from them by distillation. The residue is evaporated in the stove to a pillular consistence, when the first product is to be incorporated with it while hot. A perfectly homogeneous mass is thus obtained, which represents in a perfect state all the active parts of the valerian root.

One part of the extract is equivalent to five parts of valerian.

## OBSERVATIONS ON THE PRECEDING PAPER.

BY M. SOUBEIRAN.

The object proposed in the preparation of extracts is to concentrate into a small mass the active parts of plants, without at all changing the state of combination in which they naturally exist. M. Burin proposes to extend the use of rectified spirit, which had been previously recommended, for concentrating the active parts and separating the inert parts of plants. This object appears to me to be attained in regard to the *Solanaceæ*. Is it equally with regard to the other plants selected by M. Burin? I will only allude here to two sets of experiments, one on valerian and the other on gentian, the experiments being made, in each case, on the same roots, so as to have comparative results.

*Extract of Valerian.*

One kilogramme of the substance.	Extract obtained.	Relation to the substance.	Water dissolves.	Spirit, sp. gr. 0.921 dissolves.	Spirit sp. gr. 0.834 dissolves.
Process of M. Burin.	255 gr.	:1:4	80 per cent.	88 per cent.	96 per c.
Process of the Codex.	205 gr.	:1:4.83	88 per cent.	94 per cent.	90 per c.

These two extracts were both very aromatic; that of the Codex being, however, rather less so than the other, and its color being darker.

I diluted them with water, and obtained the following results:—

M. Burin's Extract, diluted 800 to 1, specific odor destroyed.

————— 1000 to 1, specific taste destroyed.

————— 2000 to 1, bitterness destroyed.

Extract of the Codex, diluted 400 to 1, specific odor destroyed.

————— 800 to 1, specific taste destroyed.

————— 1000 to 1, bitterness destroyed.

The substitution of spirit, sp. gr. 0.834, for spirit, sp. gr. 0.921, does not, therefore, afford a very great advantage.

#### *Extract of Gentian.*

One kilogramme of the substance.	Extract obtained.	Proportion.	Water dissolves.	Spirit, sp. gr. 0.921 dissolves.	Spirit sp. gr. 0.834 dissolves.
Process of M. Burin.	112 gr.	:1::8.9	The whole, except some flakes.	The whole,	96 per c.
Process of the Codex.	364 gr.	:1::2.75	98 per cent.	85 per cent.	20 per c.

Extract of M. Burin, diluted 10,000 to 1, bitterness still very perceptible.

————— 20,000 to 1, bitterness distinct.

Extract of the Codex, diluted 4000 to 1, the color sensible, bitterness distinct.

————— 20,000 to 1, bitterness destroyed.

The extract made with spirit, sp. gr. 0.834, contains the

bitter principle in a state of greater concentration; but what is the price at which this advantage is obtained? there is only one-third of the quantity of extract. Spirit, sp. gr. 0.834, is not a very good vehicle for extracting the bitter principle from gentian root; when it has ceased to act, spirit, sp. gr. 0.921, will dissolve a considerable quantity of the active parts; the latter is, therefore, undoubtedly preferable for the preparation of the extract.

These two examples are sufficient to show the inconvenience that may result from adopting an absolute principle, and extending its application. In extracting the soluble matter contained in plants, it should not be forgotten that the solubility peculiar to each of the principles, when isolated, is no longer the same when several of these principles are associated, and that we must not judge, *a priori*, of the action of solvents upon each of them.

*Ibid, from Ibid.*

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#### ART. XLIII.—ON THE IMPURITY OF SOME DRUGS.

BY DAVID MURDOCH, ESQ.

##### 1. *Calamine, or Carbonate of Zinc.*

As the calamine, or impure carbonate of zinc, sold in London, had been frequently examined by Dr. R. D. Thomson, and found always destitute of zinc, it became a matter of some interest to ascertain if the same remark applied to the calamine which occurs in commerce in Glasgow. Accordingly, at the request of Dr. Thomson, a specimen was subjected to analysis. The color of this substance is well known to be a light red. When it is boiled with muriatic acid, it effervesces slightly, and becomes perfectly

white, the residue consisting of heavy white powder, which, on being heated on charcoal before the blow-pipe, and then digested in acid, gives out the smell of sulpho-hydric acid; and when fused with carbonate of soda and digested with water, sulphate of soda is formed and carbonate of barytes remains unacted on. The main constituent of the commercial calamine is thus, obviously, sulphate of barytes. To ascertain if any zinc was contained in the red powder, the acid solution which was boiled upon it was mixed with a quantity of caustic ammonia in excess, which precipitated the peroxide of iron and alumina. This precipitate was filtered, and the ammoniacal liquid which passed through the filter was precipitated by oxalate of ammonia. The oxalate of lime was thrown on a filter, and the washings evaporated to dryness and heated to low redness in a platinum capsule. No residue was left; showing the absence of zinc and magnesia.

140.11 grains of calamine gave, in one analysis, sulphate of barytes and some silica, 128.05 grains; peroxide of iron and alumina, 11.55 grains; water, 0.51 grains; and the results of two analyses were as follow:—

	I.	II.
Sulphate of barytes,	88.74	89.77
Peroxide of iron and alumina,	8.01	5.74
Carbonate of lime,	2.90	4.40
Water,	0.35	0.35
	<hr/>	<hr/>
	100.	100.26

Dr. Thomson having suggested that the mode in which this adulterated article was manufactured was by mixing together a portion of the American bole, chalk, and sulphate of barytes, the next object was to examine American bole, for the purpose of comparison. The following are the results of several analyses of this substance, which is used extensively for coloring tooth-powders, &c., by druggists. The fourth analysis was made by my brother, Mr. James Murdoch:—

	I.	II.	III.	IV.
Silica,	50.15	47.31	....	49.38
Peroxide of iron,	22.69	32.96	31.	30.44
Alumina,	11.46	....	....	6.90
Lime,	6.43	....	....	
Water,	....	....	....	7.04
Sulphate of lime,	....	....	....	8.30
Magnesia,	....	....	....	1.98

To determine if any silica was contained in the sulphate of barytes of the adulterated calamine, the sulphate was fused with carbonate of soda, the fused mass washed with water until the sulphate of soda was removed, and then the residue was digested in dilute muriatic acid. A portion of silica remained undissolved; the quantity was not determined, but it is obvious that the calamine contains all the substances existing in American bole, and the conclusion is scarcely avoidable that the color is caused by the presence of this body.

## 2. *Precipitated Sulphur.*

This substance, also termed milk of sulphur and washed sulphur, is properly prepared by boiling sulphur with lime or potash, precipitating the solution with muriatic acid, and throwing the precipitated sulphur on a filter and washing it. If this form of sulphur were always prepared in this manner, no impurity would exist in it. But it has been observed that this article, in London, at least, contains always above one-half its weight of impurity. To ascertain if this substance in Glasgow was equally impure, 53.85 grains were ignited in a platinum capsule, and were found to lose 29. grains. This would make the composition of the sulphur-sulphur, 49.27, and sulphate of lime, 50.73. But as the gypsum was in crystals, it obviously contained its water of crystallization, which must therefore be calculated. The constituents of hydrous gypsum are— $\text{Ca O} = 3.5 \text{ S O}_3 = 5.2 \text{ H O} = 2.25 = 10.75$ . The quantity of water belonging

to the sulphate of lime found in the analysis will therefore be 13.42 per cent. The true constituents, then, are,—

Sulphate of lime,	50.73
Water of crystallization,	13.42
Sulphur,	35.85
	100.

### 3. *Oxide of Zinc.*

This oxide generally effervesces on the addition of an acid, proving the presence of carbonate of zinc, or of the carbonate with which it has been precipitated. When, to the solution of this oxide in muriatic acid, an excess of caustic ammonia is added, some brownish-red flocks of peroxide of iron remain undissolved, containing, perhaps, a little alumina, amounting to about one-half per cent.

### 4. *Red Oxide of Iron.*

This oxide, as sold in the shops, has been examined by my brother, Mr. James Murdoch, and found to contain a small percentage of alumina.

### 5. *Tartar Emetic.*

This salt generally contains a small quantity of peroxide of iron.

*Glasgow College Laboratory, April, 1844.*

*Pharmaceutical Journal.*

#### NOTE BY DR. R. D. THOMSON.

The first person who published an account of the extraordinary mixture called Calamine in the shops, was Mr. Brett, in the *British Annals of Medicine*, vol. i., p. 485. He found, however, traces of lead and zinc in the specimens which he analysed, a circumstance which has never occurred to me, either before or since that period. It is possible,

therefore, that the specimens may vary slightly; sulphate of lead is a probable ingredient, in minute quantities; but I very much doubt if the manufacturer of this article is honest enough to supply his customers with even a trace of zinc. It is not a little remarkable that this adulterated article should have for so long a period been infesting every drug-shop, to the utter exclusion, apparently, of the genuine article in England and Scotland, without any complaint from those who purchased it. Does this fact not prove that as calamine is used in the form of ointment, it is the lard which is the efficient application? Mr. George Schweitzer, of Brighton, first published an account of the impure milk of sulphur in the *British Annals of Medicine*, in 1837, vol. i., p. 618, and showed that the sulphate of lime was introduced by substituting sulphuric acid for muriatic acid in the precipitation of the sulphur from its base. I may mention that this adulteration is easily detected by the microscope, the crystals of sulphate of lime being very apparent. It is not easy to discover any other method of excluding such adulterated articles from commerce, unless by the acquisition of a scientific knowledge of chemistry by the druggists of this country.

*London Lancet.*

**ART. XLIV.—DESCRIPTION OF THE FRANKINCENSE-TREE, AS FOUND NEAR CAPE GARDUFOI, ON THE SOMAULI COAST.**

BY CAPTAIN G. B. KEMPTHORNE,

Indian Navy, Commanding the Hon. Company's Sloop of War "Clive."

AT Bunder Cassim, about one hundred miles to the eastward of Berbera, the mountains come close down to the coast; there is a pass and road over them, and a few hours' walking will, it is said, lead to a fine climate, and to a beautifully fertile country, abounding in the elephant, the rhinoceros, and the lion, and thickly populated by pastoral tribes. Several rivers take their source in the high land, and flowing to the southward and eastward, fall into the Indian ocean, four or five degrees north of the equator.

The chief town of the Mijertheyn Somauli is at Bunder Maryah, which lies twenty miles south-west of Ras Feeluk. The range is here about 5000 feet in altitude, and three miles from the shore. Ascending 1000 feet, a wide plain presents itself, bounded on every side by precipitous mountains, studded with the dragon's blood, frankincense, and gum acacia-trees, but looking bare and naked from the total absence of underwood.

The *luban* or frankincense assumes the most singular aspect, from the fact of its invariably growing from the bare and smooth sides of the white marble rocks of which these hills are composed, without any soil whatever to nourish or the least fissure to support it. Many of the trees have even attached themselves to the huge masses that have rolled down into the valley, and now lie over the stony surface. From the base of the trunk, and about treble its diameter, a very round thick substance is protruded, of a nature between bark and wood. This adheres

most firmly to the stone, and at a distance resembles a mixture of mortar and lime. From the centre of the mass the stem, having first taken a bend or curve outward of several inches, rises straight up to a height of forty feet. It throws from the top short branches, covered with a very bright green foliage, the leaves being narrow and rounded at the end, five or six inches in length by one broad ; crimped, like the frill of a shirt, or rather bearing a stronger resemblance to that beautiful species of seaweed found along the coast of England, and styled by urchins, "the old gentleman's ruffles."

From a foot to eighteen inches is the usual girth of the stem, and it tapers gradually away to the summit. The bark is perfectly smooth, and consists of four distinct layers. The outermost of all is very thin, and similar to that of the beech. The two next are of a singularly fine texture, resembling oiled letter-paper, perfectly transparent, and of a beautiful amber color. It is used by the Somauli to write upon. The inner bark of all is about an inch thick, of a dull reddish hue, tough, and not unlike leather, but yielding a strong aromatic perfume. The wood is white and soft, and might be applied to many useful purposes. By making a deep incision into the inner rind, the gum exudes profusely, of the color and consistency of milk, but hardening into a mass by exposure to the atmosphere.

The whole mountain-range from Bunder Maryah to Cape Gardufoi is composed of limestone and marble ; and near the latter place, especially, the marble is so white and pure that it approaches to alabaster. Pink and greyish-black are also common colors ; and in parts it might be mistaken for sandstone, until chipped off with the hammer. On the plain visited, the frankincense is nowhere to be found resting upon the ground, or upon any sort of soil ; and the purer the marble to which it adheres, the finer the growth of the tree. It would seem that this singular production of the vegetable world derives its sole nourishment from car-

bonate of lime. The young trees produce the best and most valuable gum; the older merely yielding a clear glutinous fluid resembling copal varnish, and exhaling a strong resinous odor.

During the south-west monsoon, the pastoral tribes in the neighborhood of Ras Feeluk collect large quantities of frankincense, which they barter to the Bonians, of whom a few reside at the villages along the Abyssinian coast. Boats from Maculla, and from other ports on the opposite Arabian shore, also come across during the fine season, and carry away the gums that have been accumulated, and which are exchanged for a coarse kind of cotton cloth worn by the Somauli.—*Harris's Highlands of Æthiopia*, vol. i., p. 417. 2d edit. 1844.

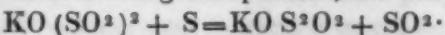
[There are two kinds of olibanum or frankincense described in pharmacological works, one called *Indian olibanum*, which is obtained from the *Boswellia surata*, the other denominated *African* or *Arabian olibanum*. The latter is obviously the one referred to by Captain Kempthorne. As found in commerce, it is always intermixed with crystals of carbonate of lime. No botanical description of the tree yielding it has yet been published.—*Ed. Pharm. Jour.*

## ART. XLV.—ON THE PREPARATION OF THE HYPOSULPHITE AND OF THE TRITHIONATE OF POTASH.

BY M. PLESSY.

M. LANGLOIS, to whom the discovery of trithionic acid is due, obtains it in combination with potash in the following manner :—He prepares some bisulphite of potash by passing sulphurous acid in excess into a solution of pure carbonate of potash. The salt thus obtained is introduced into a vessel containing pure flowers of sulphur, and the whole digested on a sand-bath, the temperature of which should not cause it to boil. Sulphurous acid is disengaged, and some sulphate is produced ; the liquid assumes a yellow tint, which disappears at the end of two or three days, when the formation of the new compound is complete. The liquid, filtered whilst hot, becomes opake on cooling, and deposits some crystals, which are coated with a little sulphur. They are purified by dissolving them in a small quantity of warm water ; the filtered solution no longer becomes opake, and furnishes very beautiful prismatic crystals.

When therefore sulphur is dissolved in the bisulphite, a liquid is obtained, which deposits a quantity of sulphur on boiling, and affords but a small quantity of the trithionate of potash and of an impure hyposulphite. The reaction does not take place in the manner first supposed ; and although sulphurous acid is disengaged under the circumstances in which M. Langlois operated, we cannot have



This evolution of sulphurous acid, observed by M. Langlois, does not always happen ; thus it does not take place at  $77^\circ$  to  $86^\circ$ , and nevertheless the sulphur dissolves in the bisulphite. But if the bisulphite of potash is not adapted for the preparation of the hyposulphite, the neutral sulphite does perfectly well.

I will describe in a few words the process which I have adopted for preparing the hyposulphite of potash from the neutral sulphite. It may be of some service, as pure hyposulphite of soda may equally be obtained by it; and this is now a very important object of commerce.

Bisulphate of potash is prepared as above described; the carbonate of potash is wholly converted into bisulphite when the sulphurous acid passes off without dissolving. This is then converted into the neutral salt by adding carbonate of potash until it produces no further effervescence; the neutral sulphite, thus prepared, is boiled in a capsule or flask with flowers of sulphur, for fifteen or twenty minutes, stirring frequently with a glass rod to facilitate the solution of the sulphur. The liquid separated from the excess of sulphur is evaporated over the fire to a syrupy consistence; if any sulphate has formed in the course of the operation by the absorption of oxygen, a portion of the salt separates at this point of concentration. The clear liquid is decanted after 24 hours' standing, and again concentrated, which however does not determine the precipitation of a fresh quantity of sulphate, and in the course of 24 hours beautiful crystals of hyposulphite gradually form in a dry place.

The presence of the sulphate, far from being disadvantageous, causes the hyposulphite to crystallize better than from a pure concentrated solution. The crystals as obtained are perfectly colorless, transparent and hard, very soluble in water, not deliquescent, and contain 2 equiv. water of crystallization.

The hyposulphite of soda may be purified by melting it in its water of crystallization; on cooling, very beautiful crystals of hyposulphite separate, which are removed from the liquid containing the impurities.

I will now proceed to describe the process I employ for preparing the trithionate of potash.

I obtain this salt by the action of sulphurous acid on the hyposulphite of potash. This very remarkable action in

some degree explains the formation of  $S_3 O_6 KO$  by M. Langlois's process. In fact, it may be admitted that the sulphur, on dissolving in the bisulphite of potash, forms hyposulphite; and that the excess of sulphurous acid, instead of being disengaged, reacts upon this salt so as to produce the trithionate. This supposition, in fact, led me to examine the action of sulphurous acid on the hyposulphite of potash.

The following is the method I employ for the preparation of M. Langlois's salt:—

I procure a solution of hyposulphite of potash, so concentrated that it will not mix with alcohol of 0.851 spec. grav. When dry or crystallized hyposulphite of potash is conveyed into water to which about  $\frac{1}{2}$  volume of this alcohol has been added, the alcohol separates at a certain period, and comes to the surface. I add then no more salt, and pass through some sulphurous acid, generated from sulphuric acid and powdered charcoal; the solution of the hyposulphite is, however, previously heated to about 77° or 86°. If the disengagement of the gas is rather rapid, this temperature maintains itself. From time to time a little hyposulphite is added, taking care that the temperature always remains constant. When the liquid acquires an intense yellow color, and gives off the smell of sulphurous acid, the disengagement of this gas is discontinued, and after some hours, in the course of the night, the liquor becomes colorless, quite loses the odor of sulphurous acid, and deposits a large quantity of crystals. The alcohol which floated on the surface now mixes with the liquid, which indicates that a fresh quantity of hyposulphite should be added, and more sulphurous acid passed through, if a greater quantity of crystals is desired.

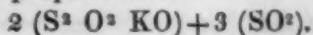
When a sufficient quantity of these crystals has been obtained, they are dissolved in water at 122° or 140°, the solution filtered to separate the sulphur they contain, and then an eighth of its volume of alcohol of 0.851 spec. grav. added

to the filtered liquor; it is again heated a little, and the solution furnishes on cooling perfectly pure, beautiful quadrilateral prisms. Their taste is slightly saline and bitter. On exposure to heat, they afford sulphurous acid, sulphur, and leave a residue of 64.36 neutral sulphate of potash; they are neutral, and dissolve readily in water. The aqueous solution is decomposed by sulphuric and nitric acids, with deposition of sulphur and disengagement of sulphurous acid. Hydrochloric acid does not decompose them; they do not give precipitates with solutions of lime, barytes, iron, zinc, magnesia, nickel, &c. They decolorize the red sulphate of manganese, but do not act on a solution of sulphate of copper; they precipitate the salts of protoxide of mercury black, those of the duetoxide blue, and give with the nitrate of silver a yellowish-white precipitate, which soon becomes black. The salt in question consequently possesses all the properties of the trithionate of potash.

The mother-ley of the crystals just described becomes turbid, and deposits sulphur when exposed to a temperature which would not decompose a solution of the trithionate of potash; and on adding some concentrated alcohol, deposits a salt in which crystals are perceptible, the form of which differs from that of the trithionate.

M. Gelis informs me that these crystals must be the tetrathionate, since this salt is likewise produced by the reaction of sulphurous acid on the hyposulphite.

When I became aware that M. Gelis was also investigating this reaction, I had only been able to determine approximately the quantity of sulphurous acid absorbed by a given weight of hyposulphite. I had observed, without, however, being certain of my results, that the absorption took place in the proportion of



A deposit of sulphur is always formed when concentrated liquors are acted upon. It became important to ascertain whether this deposit took place when dilute solutions were

employed. I found that none forms in this case, and nevertheless there is absorption of sulphurous acid. MM. Gelis and Fordos have, however, analysed this reaction, and have been led to the following equation:—



The tetrathionate can be removed from the mother-ley from which the trithionate of potash was deposited. It is a white salt, not stable, but which keeps well enough in contact with the air when in the state of crystals and dry.

When the absorption of sulphurous acid by the hyposulphite of potash has determined the precipitation of a certain quantity of trithionate and of the tetrathionate of potash, some sulphate is found in the liquor. I have observed it form when access of air has been prevented; for when a recently prepared solution of sulphurous acid in boiled distilled water is passed under a bell-glass over mercury, and then a sufficient quantity of crystallized hyposulphite free from sulphate introduced, the sulphurous acid will be found to be completely absorbed after four-and-twenty hours, and the liquid forms a precipitate with chloride of barium, which does not dissolve entirely in dilute hydrochloric acid.

*Chemical Gazette, from Ann. de Chim. et de Phys.*

## ART. XLVI.—INVESTIGATIONS CONCERNING CREOSOTE.

BY M. H. DEVILLE.

THE studies concerning the resins and essences which the Academy has been kind enough to encourage, have led me to think that it is necessary to consider the action of fire on these latter as not being a purely disorganising action. This action would be, on the contrary, in my opinion, incapable of effecting a profound change in the state of combination of the substances which constitute a body so complex as a resin. As it is generally admitted that an essential oil, homogeneous or not, has given rise, by its alteration in the vegetable, to the resin, the action of the fire on the latter would furnish a principal product identical with the primitive essential oil, or at least isomeric with it; it is thus we may find, or at least recognize, the essential oils from which benzoin, guaiacum, and other resins are procured, in which these oils have entirely disappeared.

This hypothesis, applicable to a certain number of resinous substances, I have already verified as regards some of them: creosote again gives me an opportunity of returning to it. Indeed, all my experiments lead me to believe that creosote is nothing more than an essential oil, or a substance isomeric with it, produced in the distillation of the resinous matters contained in wood.\* We find here the same circumstances in which hydroguret of guaiacyle is formed by means of guaiacum.

Creosote and hydroguret of guaiacyle have analogies which are never wanting. The same reactions, the same chemical and physical properties correspond in a remarkable manner,

\* It is thus explained how creosote varies in composition with the quality of the woods from which it is extracted, and why certain woods do not yield it.

notwithstanding the difference of composition. The hydroguret of guaiacyle ( $C^{28} H_{16} O^4$ ) may be regarded as an oxide of creosote, ( $C^{28} H_{16} O^2 = 2$  volumes of vapor.)

Creosote colors blue a great quantity of water containing a trace of a salt of peroxide of iron; with the hydroguret of guaiacyle, the coloration is brown. Creosote represents, by its composition, alcohol of the benzoic series. Bromine gives a crystallized acid with creosote, half of whose hydrogen is replaced by bromine, equivalent for equivalent.

Hydroguret of guaiacyle and creosote, treated by sulphuric acid and chromate of potassa, give rise to a salt of chromium analogous to tartrochromic acid. From the acid produced with creosote I extract a resin, which appears to me very interesting for the verification of the hypothesis on which I found the formation of creosote in the distillation of wood.

Absolutely pure creosote is not colored in the air. It combines with alkalis and bases, as Reichenbach observed, and its solution is colored blue by the salts of iron. All these properties render it similar to hydroguret of salicyle, beside which it may perhaps be placed by doubling its formula.

*The Chemist, from Comptes Rendus.*

ART. XLVII —MEMOIR ON ALTERATIONS EXPERIENCED  
BY SOME ORGANIC ALKALIS, IN CONTACT WITH, AND  
UNDER THE INFLUENCE OF, OXYGEN IN THE NAS-  
CENT STATE.

BY M. EUGENE MARCHAND.

WHEN a solution of sulphate of cinchonine, quinine, morphia, narcotine, strychnia, or bracine, is boiled with an excess of peroxide of lead, adding to the liquor, drop by drop, dilute sulphuric acid, until a portion of the filtered liquor is not rendered turbid when tested with either ammonia or caustic potassa, or by the carbonates of potassa or soda, it may be remarked that, from the commencement of the re-action, a brisk effervescence, due to a disengagement of carbonic acid gas is manifested, and that the liquor acquires a deeper and deeper color. By stopping the operation at the moment which I have just noticed, by saturating the free acid which may exist by means of litharge; then by evaporating this liquor to dryness, redissolving the residue by distilled water, in order to submit the solution to a current of hydrogen, and finally evaporating the liquor to dryness, coloring matters are obtained very distinct from each organic alkali, and each of which we will study separately.

PRODUCTS DERIVED FROM CINCHONINE.

This alkaloïd, when it is placed in the conditions which we have just indicated, is converted into a new substance, for which I have proposed the name of *cinchonetine*. It is a coloring matter, which is presented under the form of an uncrySTALLizable amorphous mass, of a very deep violet color in the mass, and of a yellowish red when in a thin layer. It is deliquescent, and possessed of a bitter taste. When incinerated, it enters into fusion, gives off, like cinchonine,

white odorous vapors, containing no ammonia ; it inflames, burns with a fuliginous flame, and leaves, as a residue, charcoal which is very difficult to incinerate.

Cinchonine dissolves more easily in boiling water than in cold water. Its best solvent is alcohol. Ether has no action on it. Concentrated sulphuric acid very readily dissolves it with a red color, and without appearing to make it undergo any alteration. If this solution be diluted with water, it assumes a yellow tint, and is not turbid.

The aqueous solution of cinchonetine, which is colored red, does not become turbid under the influence of ammonia or potassa, but, by its contact with these reagents, it assumes a purple color, which afterwards passes to fawn yellow, and the acids cannot restore to it its primitive color. The subacetate of lead occasions in this solution (which chlorine instantaneously deprives of color) a violet precipitate, which is deposited in a few moments.

Cinchonetine may, in contact with peroxide of lead, and under the influence of sulphuric acid, be converted, by aid of heat, into new colorless compounds, among which it appears acetic acid may be reckoned.

#### PRODUCTS DERIVED FROM QUININE.

The result of the action exerted by the nascent oxygen on this organic base, as a complex matter which acts under the influence of heat, in a manner analogous to cinchonetine, and which may be separated into at least two distinct principles, quinette and modified quinette. The first of these bodies is that which remains when the complex coloring matter is treated by water: it is insoluble in this liquid, but it dissolved in alcohol, to which it imparts a violet color. Modified quinette is, on the contrary, the principle which water dissolves, acquiring a blood-red color.

#### *Modified Quinette.*

It is presented under the form of an amorphous mass, of a red color, of a bitter taste, soluble in water, alcohol, and

ether. Its aqueous solution, when it is boiled in order to evaporate it to dryness, is decomposed, depositing a black powder, insoluble in alcohol and ether.

Potassa and ammonia decolor the aqueous solution of this substance, which from red passes to a dirty yellow, but without causing it to undergo any modifications, as is the case with cinchonetine. for the original color may always be restored by saturating the alkali with sulphuric acid. Modified quinette dissolves in concentrated nitric and sulphuric acids, communicating to them its color.

#### *Quinetine.*

By the spontaneous evaporation of its alcoholic solution, this substance may be obtained in great part crystallized. It is insoluble in water, but it dissolves very well in alcohol, ether, and water acidulated with sulphuric acid. It communicates to the first two solvents a violet color, and to the last a red color. Although this substance is insoluble in water, its alcoholic solution is not rendered turbid when diluted with this liquid.

Potassa and caustic ammonia act with it in the same manner as with modified quinette.

The concentrated acids dissolve quinette, acquiring a red color. It is probable that it then passes to the state of modified quinette.

By successive solutions and evaporation, quinette may be rendered soluble in water, and then it appears to present all the characters of modified quinette.

#### PRODUCTS DERIVED FROM MORPHIA.

Morphetine is the product of the oxidation of this base, when it is submitted to the above-mentioned influences. It is a brown, amorphous substance, possessed of a feeble, bitter taste ; sparingly soluble in alcohol at 90° C., which it colors yellow ; very soluble, on the contrary, in distilled water, to which it communicates, at the same time, a yel-

low color verging on red, and the property of reddening litmus paper. Sulphuric and nitric acids turn to pale yellow the color of this solution, which becomes, on the contrary, deeper under the influence of caustic alkalis. This solution is not rendered turbid nor altered by triacetate of lead.

Concentrated sulphuric acid only very difficultly dissolves morphetine. Nitric acid, on the contrary, readily dissolves it, acquiring a yellow color.

Morphetine, submitted in its turn to the action of peroxide of lead, until no more effervescence is produced, is converted into a yellow, uncryallizable matter, endowed with acid properties.

#### PRODUCTS DERIVED FROM NARCOTINE.

When this alkaloid is submitted to the action of oxygenising bodies, and in the conditions which we have described above, a new coloring matter is obtained, *narcotein*, which is presented under the form of an amorphous or crystallizable mass, of a brown color, and possessing a very bitter taste. It is very sparingly soluble in ether, but it dissolves very readily, on the contrary, in alcohol and in water. It is soluble in concentrated nitric acid, which it colors yellow. It likewise dissolves with great facility in concentrated sulphuric acid, to which it communicates a magnificent red color, from which it passes to yellow when this solution is diluted with water.

The aqueous solution of narcotein is of a yellow color; when ammonia or caustic potassa is added, the color becomes rather brighter, and even passes to yellowish-red. Subacetate of lead does not alter either its color or its transparency.

Narcotein, when submitted to the action of nascent oxygen until effervescence ceases, is gradually decolored, and is converted into a new body, the opianic acid, formerly obtained by Liebig and Wohler, in their experiments on the oxidation of narcotein.

## PRODUCTS DERIVED FROM STRYCHNIA.

The most remarkable product obtained by submitting strychnia to the action of nascent oxygen is a pulverulent mass, of a brownish-yellow color, insoluble, or very sparingly soluble in boiling water, which it colors of a dirty yellow, and to which it communicates a bitter taste, extremely sparingly soluble in alcohol, soluble in ether, soluble also in water acidulated with sulphuric acid, and boiling, from which it is in great part precipitated by cooling.

The best solvent of this substance is caustic potassa ; the solution is of a brown color, and, if we employ only as much potassa as is strictly necessary for operating its solution, the liquor is without action on syrup of violets. When sulphuric acid is added to the solution, so as to communicate to it an acid reaction, it becomes turbid, and deposits a flocculent and yellowish precipitate. The perfectly neutral alkaline solution has no action on the solution of iron and copper ; but it precipitates the solutions of lead and silver. This substance deserves to fix the attention of chemists. The remarkable manner in which it acts with caustic potassa, which it seems to saturate completely, will, perhaps, cause it to be regarded as a *new acid*.

## PRODUCTS DERIVED FROM BRUCIA.

The coloring matters which result from the action of oxygen on this alkaloid are two in number. The first is soluble in boiling alcohol at 90° C., which it colors of a yellowish-red. We shall study it in A. The second, which will be studied in B, is insoluble in alcohol at 90° C., but it readily dissolves, on the contrary, in this liquid boiling, and diluted with half its weight of distilled water. The solution which results from it possesses a fine red color.

A. This is a brown, uncrystallizable substance, possessing a very bitter taste, and very sparingly soluble in ether soluble in boiling alcohol at 90° C.; soluble in distilled water, which it colors of a yellowish-red; it is soluble in con-

centrated nitric acid, producing a red color as beautiful as that resulting from the action of this acid on brucia. Sulphuric acid also dissolves it, but more slowly, and likewise assumes a very fine red color. Hydrochloric and acetic acids, as well as caustic potassa, also dissolve it very well, but they take a yellow color.

B. This substance, like the foregoing, is uncrySTALLizable; its taste is bitter, and it has a red color when in a thin layer, and black when in a mass. It is insoluble in ether and in boiling alcohol at 90° C. It dissolves very well in this latter liquid when diluted with water. It dissolves in distilled water, to which it communicates a beautiful wine-red color, which the acids render rather brighter, whilst caustic potassa turns it rather brown, and the subacetate of lead yellow.

Concentrated sulphuric and nitric acids dissolve this substance, as also does caustic potassa, acquiring a more or less deep yellowish-red color.

The experiments which constitute the subject of this memoir are still very incomplete. Most of the bodies whose existence I have noticed have not probably been obtained in the perfectly pure state. The new investigations are, therefore, necessary: they will form the subject of a second memoir, which I will terminate with some reflections concerning the nature of the phenomena which accompany these curious metamorphoses of the organic alkalis.

*Ibid, from Journal de Chimie Médicale.*

and seized to the committee, but submitted to shield and  
protect him from being sent to trial on the charge before  
**ART. XLVIII.—ON THE MEANS OF ASCERTAINING THE  
ADULTERATION OF POTASSA BY SODA, AND DETER-  
MINING IN A SIMPLE MANNER, THE PROPORTION OF  
THE LATTER.**

BY E. F. ANTHON, OF WEISGRUN.

THE following prize question, proposed among other subjects by the *Societé de Pharmacie*, of Paris, “to give an easy and commercial process for detecting the presence and proportion of soda in the potassa of commerce,” induced me to undertake this work.

In order to find a process of this nature, proper for determining the proportion of soda in potassa, adulterated by this alkali, and of giving a satisfactory result, with respect to celerity and accuracy, even in the hands of persons unacquainted with chemistry, it was necessary to submit to a more attentive examination the processes hitherto employed for separating the salts of soda from those of potassa.

A process ordinarily employed in analysis, and which presents also the necessary accuracy, is that of Berzelius; it consists in converting the two alkalis into metallic chlorides, evaporating to dryness, and heating in a platinum crucible to the commencement of redness, and then weighing. The saline mass thus obtained should be mixed with  $\frac{3}{4}$  times its weight of crystallised chloride of platinum and sodium, which may also be replaced by a solution of chloride of platinum, to which a small quantity of chloride of sodium has been added. It must afterwards be dissolved in very little water, evaporated almost to dryness at a very gentle heat, and then treated by alcohol of 60 per cent. The chloride of sodium is dissolved in it as well as the chloride of platinum and sodium added in excess, and the chloride of platinum and potassium forms an insoluble residue, which must be washed on a filter with alcohol.

The chloride of platinum and potassium, after having been washed, is maintained at a very gentle heat, until several weighings show that it loses no more in weight. The quantity of chloride of platinum and potassium obtained, serves for calculating that of the potassa or chloride of potassium. One part of chloride of platinum and potassium corresponds to 0.19334 of potassa, or 0.30565 of chloride of potassium. Finally, the quantity of chloride of sodium is found by subtracting the quantity of chloride of potassium found from the total weight of the two metallic chlorides, and the quantity of soda is then deduced by calculation. One part of chloride of sodium corresponds to 0.53289 of soda.

This process is not at all applicable to the object in question : in the first place, on account of its expense ; and in the next place, because it requires an experienced chemist; and also because almost all kinds of potassa contain chloride of potassium or chloride of sodium, or else both chlorides at once, and a more or less inaccurate result must then be obtained, according to the proportion of the two metallic chlorides contained in potassa, if care have not been taken previously to ascertain their quantity, that they may not be reckoned in the second instance.

I have said sufficient to show that this process of separation, however valuable it may be, is not very applicable to the object in question.

Another process of separating potassa from soda has been indicated by Serullas. It is based on the property of perchloric acid, of giving with potassa a compound very sparingly soluble in water and insoluble in alcohol, and with soda on the contrary—a compound very soluble in water, as well as in the strongest alcohol. The operation is ordinarily performed by adding an excess of perchloric acid to the solution containing the salts of potassa and soda, and cautiously evaporating the mixture, almost to dryness. The mass obtained is then treated by alcohol, which dissolves the perchlorate of soda, with the acid which was previously combined with the two alkalis, in the case when

the perchloric acid is not driven off under the form of gas, and leaves, on the contrary, the perchlorate of potassa. The two perchlorates are then cautiously calcined, and they are converted, with a disengagement of oxygen, into chloride of potassium and chloride of sodium, which serve for calculating the quantities of potassa and soda.

Although this second process is not so expensive as the preceding, the other objections apply to it; for not only does it require too much chemical skill, but it likewise gives an inaccurate result, since the potassa of the chloride of potassium, and sulphate of potassa contained in the potassa, is found in the result, and because it is necessary, consequently, previously to make an accurate determination of the impurities accidentally or purposely mixed with the potassa.

All the re-agents which are now employed for detecting potassa and separating it from soda, such as the tartaric, hydrofluosilicic, and carbazotic acids and sulphate of alumina, are, more or less, liable to the objection of indicating not only the alkali combined with the carbonic acid, but also that combined with the sulphuric and hydrochloric acids, &c., and not being able, consequently, to give an accurate result without a previous and minute determination of the accidental mixtures of potassa.

It should, therefore, rather be possible to find, in the capacity of saturation of potassa and soda, a means of solving the question; for, by comparing the capacity of saturation of potassa with that of soda, we find a very considerable difference. Thus, for example, 100 grains of dry simple carbonate of potassa require for their neutralisation 1,000 grains of pure dilute sulphuric acid, (for alkalimetry) which contains nearly 8*1* per cent. of anhydrous acid, whilst 100 grains of anhydrous carbonate of soda require nearly 15 per cent. of the same acid for their neutralisation.

It would, therefore, be sufficient to establish, by calculation, a Table in the following form for each hundredth, in order to be able, only after the employment of an alkalimetric

test acid, to obtain immediately the indication in hundredths of the proportion of soda contained in potassa.

A anhydrous carbonate of potassa, 100 grains of which require, for their neutralisation, the following quantities of dilute sulphuric acid (of the specific gravity of 1.0687),

1000	0
1025½	5
1051	10
1102	20
1127½	25
1255	50
1382	75
1510	100

Contains the following numbers of hundredths of anhydrous carbonate of soda :—

Although such a Table may serve for determining with sufficient accuracy for the object in question, and very promptly, the proportion of soda which might be found in a pure carbonate of potassa, it is not, however, applicable to testing the various kinds of potassa of commerce, especially because all, even without being adulterated, contain different accidental mixtures, such as chloride of sodium, chloride of potassium, sulphate of potassa, silica, &c., and because, so long as we are unacquainted with the quantity of all these substances united, and have not subtracted them from the weight of the dry potassa, the preceding Table cannot be made use of with clearness; for, admitting that a potassa contains, for example, 80 per cent. of carbonate of potassa, 6.7 per cent. of accidental impurities, and 13.3 per cent. of anhydrous carbonate of soda, this potassa should, according to this Table, be regarded as pure and dry carbonate of potassa, for the 13.3 of anhydrous soda found in it would require for their neutralisation nearly as much alkalimetric test-acid as 20 of pure and dry carbonate of potassa.

But even when it is wished summarily to determine previously the quantity of accidental impurities of potassa, to subtract them from 100 grains of potassa, and to reduce to 100 the number obtained after the neutralisation, an accurate result cannot be arrived at, because we rarely find in commerce a potassa which contains only simple carbonate of potassa, without any mixture of free caustic potassa, or, which is most common, of sesquicarbonate of potassa, and in both these cases the numbers indicated in the Table would be inaccurate; for if a pure potassa, submitted to examination, contained free caustic potassa, we should, from the employment of the test-acid, maintain, according to the foregoing Table, that this potassa contained soda, whilst at another time we should declare to be free from adulteration a potassa containing much sesquicarbonate of potassa, and which would not be mixed with too great a quantity of soda. It is evident, therefore, that this Table would be applicable only after having first not only removed from the potassa submitted to examination all the foreign mixtures, with the exception of soda, but also after having transformed into simple carbonate the alkali obtained, if this were potassa alone, or mixed with soda; but as this operation would be too difficult, and would require too much chemical skill, this mode of testing, to ascertain the proportion of soda contained in potassa, cannot be admitted, at least as an ordinary process.

The same observation is applicable to the case in which it is desired to calculate the proportion of soda contained in a potassa by the increase of weight which takes place when moistened potassa is exposed to an atmosphere of carbonic acid until there is no further augmentation of weight, or by the loss of weight produced by the expulsion of carbonic acid by potassa by a more energetic acid; indeed, these two processes could be used only for operating on mixtures of pure simple carbonate of potassa with anhydrous simple carbonate of soda.

All these considerations show the difficulties which the solution of the problem entails.

I then asked myself whether it would not be possible to effect a separation by converting the alkaline carbonates of the potassa to be examined into bicarbonates, and then separating by means of a solution of bicarbonate of soda, completely saturated at the ordinary temperature, the bicarbonate of soda formed from the bicarbonate of potassa ; for, on one hand, a saturated solution of salt cannot naturally dissolve more of the same salt at the same temperature, whilst, on the other hand, it might be expected that the solution of bicarbonate of soda would dissolve not only the bicarbonate of potassa, but also the accidental impurities of the potassa, such as the chloride of potassium, the chloride of sodium, the sulphate of potassa, &c., and would leave only the bicarbonate of soda rising from the simple carbonate of soda contained in the potassa, and which would enable the quantity of this carbonate to be readily calculated.

In order to ascertain whether this idea was practically executable, I wished first to convince myself of the solubility of sulphate of potassa, chloride of potassium, and chloride of sodium, (the ordinary impurities of potassa) as well as of bicarbonate of potassa in a solution of bicarbonate of soda : I weighed with this object four times 1,000 grains of a solution completely saturated at 54.5° F., of carbonate of soda, and I added to them these four salts by grains, until they were no longer dissolved. When the last grain added remained at the bottom of the vessel without being dissolved, after the liquor had been carefully stirred, and at a temperature of 54.5° F., I found that there was dissolved in 100 parts of the solution of bicarbonate of soda—

Bicarbonate of potassa	- - - -	245	grains
Sulphate of potassa	- - - -	180	"
Chloride of potassium	- - - -	285	"
" sodium	- - - -	75	"

After having determined these proportions, I endeavored to convert into bicarbonates, by carbonic acid, mixtures, expressly prepared, of soda moistened with a solution of bicarbonate of soda; but I found that not only was this object slowly attained, but that it could be only incompletely fulfilled in a simple manner. I could not saturate with carbonic acid a complete solution of these two mixtures in water, because it is necessary to drive off all the water of the solution in order to be able to separate from each other, by a concentrated solution of bicarbonate of soda, the crystallized salts obtained. I therefore tried, in order to avoid this inconvenience, to dissolve in a solution of bicarbonate of soda, saturated cold, new mixtures, (of 100 grains) expressly prepared, of soda and potassa; this operation likewise succeeded well, and nothing remained undissolved except the silica.

I then passed for three days, a continued current of carbonic acid into these solutions thus prepared, of mixtures of potassa and soda, to which I also joined a simple solution of potassa in the concentrated solution of bicarbonate of soda.

The solution, which contained only potassa, presented, even at the end of several days' saturation by carbonic acid, no separation of bicarbonate of potassa or soda, and the liquor had not undergone (at least in appearance) the slightest change.

A solution, which contained a mixture of 90 grains of potassa and 10 grains of anhydrous carbonate of soda, gave by a current of an excess of carbonate acid a crystalline precipitate of bicarbonate of soda, which collected on a filter and pressed between folds of blotting paper, weighed, while damp, 19 grains; its weight was 14.6 grains after it had been completely dried at the ordinary temperature.

A filtered solution of 80 grains of potassa and 20 grains of anhydrous carbonate of soda, treated in the same manner, gave 22.7 grains of bicarbonate of soda, pressed and still

moist, and 16.9 grains of the same salt dry. A solution of 70 grains of potassa and 30 grains of anhydrous carbonate of soda, gave 44.1 of humid bicarbonate of soda, and 36.7 of the same salt dry.

A solution of 60 grains of potassa and 40 grains of anhydrous carbonate of soda gave, by the same process, 59.1 of humid bicarbonate of soda, and 49.7 of the same salt dry.

Finally a solution of 50 grains of potassa and 50 grains of anhydrous carbonate of soda, gave 72.2 of humid bicarbonate of soda, and 58.6 of the same salt dry.

If we examine this result a little nearer, we shall find that the quantities of bicarbonate of soda obtained are too small.

For the following quantities of simple carbonate of soda—	Should give the following quantities of crystallized bicarbonate :—
---	---

10	17.5
20	35
30	52.5
40	70.0
50	87.5

But they gave only—

Deficiency :

14.6	2.9
24.9	10.1
36.7	15.8
49.7	20.3
58.5	29.0

This too small produce is also increased by the impossibility of driving off all the liquid by means of the simple pressure of the bicarbonate of soda separated and collected on a filter, and it indeed suffered an increase of weight proportionate to the fixed principles contained in the quantity of the liquid which was not separated by pressure. Moreover, this difference would be insignificant, and it would be easy to calculate it by the weight of the bicarbonate of soda obtained in the humid and dry states, according to the

known proportions of the concentrated solution of bicarbonate of soda, if there were not other obstacles. If, now, we seek for the reason why too little bicarbonate of soda was obtained we find it in the extreme difficulty of converting into bicarbonates, by a current of carbonic acid, a mixture of soda and potassa dissolved in a solution of bicarbonate of soda; for, at the end of three days' passing of carbonic acid into a solution of potassa, mixed with only a very small quantity of soda, the liquor had always an alkaline reaction, proving that all the alkaline carbonate had not been converted into bicarbonate: this circumstance renders this process, also, insufficient for the same sure and prompt determination of the quantity of soda contained in the potassa, although it may always be used for an approximative determination, as the foregoing investigations manifestly show.

Moreover, as potassa (simple carbonate) cannot take water of crystallization, whilst anhydrous soda (this is the state in which it is found in the potassa which it serves to adulterate,) on the contrary, absorbs a very considerable quantity of it, in order to form crystals, it was natural to hope to determine, approximatively at least, the quantity of soda which might be found in the potassa, by estimating the proportion of water necessary for reducing a given quantity of potassa to a state of pappy mass; so that, even after a long time, it will not solidify any more; for it might be foreseen that there should be so much the more soda in the potassa, as more water is required to reduce the potassa to this state.

In order to carry out this idea practically, I prepared the following mixtures of pure simple carbonate of potassa, and anhydrous simple carbonate of soda:—

1. 90 gr. potassa and 10 gr. anhydrous soda.
2. 80        "        20        "
3. 70        "        30        "
4. 60        "        40        "

5.	50 gr.	potassa	and	50 gr.	anhydrous	soda.
6.	40	"		60	"	
7.	30	"		70	"	
8.	20	"		80	"	
9.	10	"		90	"	

I then added water by drops to these nine mixtures, until the state of each of them was such that they became no harder, and until they were slightly pasty, and susceptible of being kneaded. Notwithstanding the facility with which this point was attained, by an unfortunate circumstance this operation required a very long time proportionally, for this object was seldom effected in less than forty-eight hours. It is scarcely necessary to observe that, during this time, I prevented as much as possible the access of atmospheric air by covering the vessel, in order not to have false results, by the loss of water evaporating during that time. It was necessary also to take care not to leave the moistened mixtures too long without looking at them, because otherwise it often happens that the mixture hardens to such a degree that it is very troublesome to divide it properly.

After the moistened mixtures had ceased to become harder, when in a homogeneous state, and capable of being gently kneaded, I determined the quantity of water necessary for each mixture separately, and I found that the following quantities had been added :—

Grains of Water.

To the first mixture	17
" second	40
" third	57
" fourth	68
" fifth	80
" sixth	95
" seventh	107
" eighth	118
" ninth	130

It is evident that the result answered, and that the pro-

perty of soda, of being able to absorb a very great quantity of water of crystallization—a property which potassa does not possess—presents to us a means of determining, in an extremely simple manner, although only approximatively, the proportion of soda contained in potassa.

With respect to the accuracy of this process, it doubtless still leaves much to be desired; for I am convinced, from a great number of investigations, that it may yet give rise to an error of two or three per cent., even when we have become familiarized with its execution by considerable practice and that it is a pure chance if the error remains less than a hundredth. Moreover, the impurities which are ordinarily found in potassa do not interfere much with its accuracy; these are ordinarily substances, such, for example, as the sulphate of potassa, chloride of sodium, chloride of potassium, silica, &c., which do not take up water of crystallization, and the quantity of water necessary merely to moisten those ordinary impurities of potassa is so small, that it is not necessary to take account of it.

Moreover, it is necessary, in the examination of a sample of potassa by this process, to commence by freeing it from the water which it contains, by putting it in an oven, or any other warm place—or, better still, to heat it to redness, in order to convert into simple carbonates the sesquicarbonates which it may contain.

Although, according to these considerations, this process cannot be sufficient for the chemist, and should never be adopted as a basis in important cases, it may, however, very well serve the purpose of persons unacquainted with chemistry, (ordinary merchants and manufacturers,) on account of its great facility of execution.

Moreover, the circumstance already mentioned—that, on the one hand, this process cannot pretend to accuracy, and that, on the other hand, it requires a long time for its execution, (which appears to be an inconvenience for ordinary use, which requires the utmost speed)—this circumstance

I say induced me to pursue this subject still further, and with this view I had recourse to tartaric acid.

I expected to find, in the property which bitartrate of potassa possesses, of dissolving only with considerable difficulty in water, the most convenient means for founding a process of testing potassa, on the employment of this acid; for it must be foreseen, that if to a sample of potassa containing soda, be added the proportion of tartaric acid precisely necessary for converting the two alkalis into bicarbonates, the bitartrate of soda, in presence of a sufficient quantity of the solvent, should remain in solution on account of its greater solubility, and the bitartrate of potassa should be precipitated, under the form of a crystalline powder, either in greater part or entirely, when all the liquors employed have been previously saturated with bitartrate of potassa at the ordinary temperature: this deposit might then easily be measured.

In order to make a trial of this theoretical supposition, it was necessary first to solve the following question—"How much bitartrate of soda is dissolved in a solution of bitartrate of potassa, at the ordinary temperature?"

In order to solve this question, I put into 240 grains of a solution of bitartrate of potassa, completely saturated at the ordinary temperature, crystallised bitartrate of soda, until the last portion added remained undissolved, after the mixture had been well stirred—13.6 grains of bitartrate of soda were dissolved. Consequently, 100 parts of concentrated solution of bitartrate of potassa dissolve 5.6 parts of bitartrate of soda, or, to dissolve 1 part of the latter salt, 17.8 parts of the saturated solution of the bitartrate of potassa are required. If, therefore, 100 grains, for example, of anhydrous carbonate of soda be converted into 358.1 of bitartrate of soda, by the necessary quantity of tartaric acid, 6,394 grains of solution of bitartrate of potassa, completely saturated, at the ordinary temperature, are required for holding in solution the bitartrate of soda formed.

The circumstance should furnish one of the bases for the process to be followed; for the other, it was necessary to find the space which would be occupied by the quantity of bitartrate of potassa which might be formed by 100 grains of perfectly pure simple carbonate of potassa.

In order to solve this question, after some preliminary investigations, of which it is useless to speak, I took a glass tube, of as equal a diameter as possible, and of equal thickness throughout—about three feet in length, and five lines in diameter—and I closed it at one of its extremities.

I then put into this tube a solution of bitartrate of potassa which had been prepared in the following manner:—I poured into a small glass matrass, capable of being corked, on one-fourth of the quantity of bitartrate of potassa, which 100 grains of pure carbonate of potassa can furnish, that is to say on 68.2 grains about two ounces and a quarter of solution of bitartrate of potassa saturated at the ordinary temperature; I well corked it, and heated it cautiously, in order to effect the complete solution of the bitartrate of potassa.

The warm and perfectly clear solution was then promptly poured into the above-mentioned tube; the matrass was washed with a smaller quantity of solution of bitartrate of potassa, saturated cold: I well corked and agitated, until the temperature of the tube and its contents was completely reduced to that of the surrounding atmosphere, or rather to that of the solution of bitartrate of potassa, at the commencement of the experiment. I plunged the tubes several times into cold water, in order to accelerate cooling.

The crystalline powder thus separated, whose quantity, as may readily be conceived, should correspond to 25 grains of potassa, was collected in the smallest possible space by striking the tube several times on a hard body, and when new blows did not heap it up, I made a mark with a file on the tube at the level obtained by the crystalline powder of bitartrate of potassa. The space below the mark was

then divided into 25 equal parts; then I continued to graduate the tube towards the upper part, until I had marked 100 parts and I added the numbers, ascending from 6 to 5, from the lower parts towards the upper. I afterwards broke the tube at about two inches above the place marking 100, and I united with the lamp the acute angles.

This tube, thus prepared, was tried in several ways, until I was perfectly convinced that each part exactly answered to one grain of pure carbonate of potassa.

This tube then served as a standard instrument for testing a suspected sample of potassa: for this purpose we proceed in the manner I am about to describe.

Two portions, of 100 grains each, of the potassa to be examined, are weighed out. The first 100 grains are tested by the ordinary process of alkalimetry; the quantity of test-acid employed in the Table, No. I., is ascertained, and the corresponding quantity of carbonate of potassa is noted; then the second 100 grains are dissolved in 8 or 10 times their weight of the solution of bitartrate of potassa, completely saturated at the ordinary temperature, and of which a very large quantity should always be kept in reserve. The solution is filtered in a flask capable of containing about one pound of water, and the filter is washed with the saturated solution of bitartrate of potassa. Then a quantity of tartaric acid, in fine powder, is added, equal to that indicated by the adjoining Table, (No. II.,) that is to say, the quantity necessary to convert into bitartrate all the alkali which is found in the potassa (potassa or soda, or both at once, carbonated or caustic.) This done, a sufficient quantity of the same solution of bitartrate of potassa at a known temperature is poured into the flask, so that its whole quantity may amount to about 6,400 grains. A slight excess or deficiency is generally without inconvenience. In order not to be obliged to weigh every time, the height obtained by the liquor may be marked with a file.

The flask is then corked, put in a warm place, and care-

fully stirred. It is not at all necessary that the bitartrate of potassa ready formed should then be completely dissolved, because it does not prevent the alkali from being converted into bitartrate, and changed into a fine crystalline powder; but in order that afterwards the precipitation of the powder of bitartrate of potassa may take place in a very uniform manner, and allow of as concordant a measuring as possible, it is better to heat and agitate the corked flask until the solution is complete; but, as I have already said, this care may be very well neglected, without fear of committing any essential error. The heated and still corked flask must be cooled as speedily as possible, by plunging it into water, or snow in winter, and stirring it briskly. It is as well, then, in order to obtain a crystalline powder of a very equal grain, to reduce the temperature of the flask and its contents below that of the surrounding atmosphere; but in that case, it is necessary to restore their temperature to the same degree as that of the solution of bitartrate of potassa, saturated cold, before the experiment: this is easily done. The cork of the flask is then replaced by another, in which is securely fixed the open extremity of the measuring tube. However, it is necessary that neither the tube nor the cork descend into the neck of the flask more than is necessary, for the cork to be hermetically adapted to the sides of the neck, in order that, when the flask is inverted, it may not deposit crystalline powder between the cork and neck of the flask. The flask is then inverted, and, by shaking it, all the powder of bitartrate of potassa is made to fall into the tube; then the flask is withdrawn; it is then no longer necessary to take account of its contents for the test, (and the tube is struck on a solid body until the crystalline powder is collected into the smallest possible space,) and we may then, without any other operation, read on the scale the number of hundredths of pure carbonate of potassa contained in the potassa examined.

After having ascertained in the manner described, the

quantity of pure carbonate of potassa which is found in the potassa examined, we seek for the difference which exists between the parts of the test acid employed in the alkalimeter, and the hundredths of carbonate of potassa found in the measuring tube, and this number sought in the Table (No. III.) then indicates, without any other calculation, the proportion of hundredths of soda with which the potassa examined was adulterated.

Let us suppose, for example, that 100 grains of a sample of potassa had employed for their neutralisation 60 degrees of test acid, the quantity of carbonate of potassa which corresponds to them must be sought for in the table, No. I. The number in question is 87.5. Now, if 100 grains of the same potassa gave likewise 87.5 of crystalline powder in the measuring tube, there would be no difference between the two numbers found, and it must be concluded that the potassa in question was not adulterated with soda.

If, in another experiment, the quantity of carbonate of potassa found by the alkalimeter was 52, and if my measuring tube indicated only 32, it would be necessary to subtract this latter number (which represents the hundredths of pure carbonate of potassa really contained in the potassa) from the first, namely, 52, and to seek the difference (20 in this case) in Table III. in order to find the number of hundredths of soda with which the potassa examined is adulterated : this would be 22.5 hundredths in the present case. The 25.5 hundredths which are still wanting should then be attributed to the ordinary and accidental impurities of potassa.

If a saline mass sold for potassa, gave by the alkalimeter 80 degrees, and if there were not formed, on the contrary, any crystalline powder in the measuring tube, the salt in question would be only carbonate of soda, with 10 per cent. of other impurities; for the number found of alkalimetric degrees would immediately indicate the difference sought for, since, in the latter case, there would be nothing to be subtracted.

We may here remark, in conclusion, that this process, which has fully satisfied me, may also be simplified by using an alkalimeter with a solution of tartaric acid, saturated with bitartrate of potassa, instead of test-acid, and dividing the alkalimeter in such a manner, that each degree shall answer to one grain of pure carbonate of potassa; for, in this case, it is sufficient to neutralize the 100 grains of potassa submitted to examination, to note the quantity of test-acid employed; to add, also, an equal quantity of test-acid, as has been indicated above, and the difference between the carbonate of potassa, indicated by the alkalimeter and in the tube, will give, by aid of Table III., the measure of the adulteration.

TABLE I.

The following degrees of the Alkalimeter:-	Answer to the follow- ing quantities of Car- bonate of Potassa.	The following degrees of the Alkalimeter:-	Answer to the follow- ing quantities of Car- bonate of Potassa.
1	1.45	46	67.08
2	2.91	47	68.54
3	4.37	48	70.00
4	5.83	49	71.45
5	7.39	50	72.91
6	8.74	51	74.37
7	10.20	52	75.83
8	11.66	53	77.29
9	13.12	54	78.75
10	14.58	55	80.20
11	16.04	56	81.66
12	17.50	57	83.12
13	18.95	58	84.58
14	20.41	59	86.04
15	21.87	60	87.50
16	23.33	61	88.95
17	24.79	62	90.41
18	26.24	63	91.87
19	27.70	64	93.33
20	29.16	65	94.79
21	30.62	66	96.25
22	32.08	67	97.70
23	33.54	68	99.16
24	35.00	69	100.62
25	36.45	70	102.08
26	37.91	71	103.54
27	39.37	72	105.00
28	40.83	73	106.45
29	42.29	74	107.91
30	43.75	75	109.37
31	45.20	76	110.83
32	46.66	77	112.29
33	48.12	78	113.75
34	49.58	79	115.20
35	51.04	80	116.66
36	52.50	81	118.12
37	53.95	82	119.58
38	55.41	83	121.04
39	56.87	84	122.50
40	58.33	85	123.95
41	59.79	86	125.41
42	61.25	87	126.87
43	62.70	88	128.33
44	64.16	89	129.79
45	65.62	0	

TABLE II.

To a Potassa which marks the following degrees of the Alka- limeter—	Must be added the fol- lowing quantity of tartaric acid:—	To a Potassa which marks the following degrees of the Alka- limeter—	Must be added the fol- lowing quantity of tartaric acid:—
1	3.19	46	147.07
2	6.39	47	150.27
3	9.59	48	153.47
4	12.78	49	150.67
5	15.98	50	159.86
6	19.18	51	163.06
7	22.38	52	166.26
8	25.57	53	169.46
9	28.77	54	172.65
10	31.97	55	175.85
11	35.17	56	179.05
12	38.36	57	182.25
13	41.56	58	185.44
14	44.76	59	188.64
15	47.96	60	191.84
16	51.15	61	195.03
17	54.35	62	198.23
18	57.55	63	201.43
19	60.75	64	204.63
20	63.94	65	207.83
21	67.44	66	211.02
22	70.34	67	214.22
23	73.53	68	217.42
24	76.73	69	220.61
25	79.93	70	223.81
26	83.13	71	227.01
27	86.32	72	230.21
28	89.92	73	233.60
29	92.72	74	236.40
30	95.92	75	239.80
31	99.11	76	243.00
32	102.31	77	246.19
33	105.51	78	249.39
34	108.71	79	252.59
35	111.90	80	255.79
36	115.10	81	258.98
37	118.30	82	262.18
38	121.50	83	265.38
39	124.69	84	268.57
40	127.89	85	271.77
41	131.09	86	274.97
42	134.28	87	278.17
43	137.48	88	281.36
44	140.68	89	284.56
45	143.88		

TABLE III.

If the difference is—	The Potassa tested is adulterated by the following quantities of Soda in hundredths.	If the difference is—	The Potassa tested is adulterated by the following quantities of Soda in hundredths.
1	1.125	46	51.75
2	2.25	47	52.87
3	3.37	48	54
4	4.50	49	55.12
5	5.6	50	56.25
6	6.75	51	57.37
7	7.87	52	58.5
8	9	53	59.62
9	10.12	54	60.75
10	11.25	55	61.87
11	12.375	56	63
12	13.50	57	64.12
13	14.62	58	65.25
14	15.75	59	66.37
15	16.87	60	67.5
16	18	61	68.62
17	19.12	62	69.75
18	20.25	63	70.87
19	21.37	64	72
20	22.50	65	73.12
21	23.62	66	74.25
22	24.75	67	75.37
23	25.87	68	76.50
24	27	69	77.62
25	28.125	70	78.75
26	29.25	71	79.87
27	30.37	72	81
28	31.5	73	82.12
29	32.62	74	83.25
30	33.75	75	84.37
31	34.87	76	85.50
32	36.0	77	86.62
33	37.125	78	87.75
34	38.25	79	88.87
35	39.37	80	90
36	40.50	81	91.12
37	41.62	82	92.25
38	42.75	83	93.37
39	43.87	84	94.50
40	45.00	85	95.62
41	46.12	86	96.75
42	47.25	87	97.87
43	48.37	88	99
44	49.50	89	101.12
45	50.62		

*Ibid, from Repertorium fur die Pharmacie.*

## ART. XLIX.—MEMOIR ON ALCOHOLIC FERMENTS.

BY M. BOUCHARDAT.

THE author proposes, in this memoir, more especially to make known two kinds of alcoholic ferments, which he distinguishes from beer yeast, and to notice the principal characters of the alcoholic ferments whose existence he admits. The following table presents a summary of the characters of these three kinds of ferments:—

FERMENT OF BEER (*fermentum cerevisiae*.\*)

1. Globules sometimes perfectly round, but ordinarily ovoid. These globules are not flattened like those of the blood, but they have a very regular spheroidal form, like the albuminous globules of the brain. The diameter of these globules varied, in my observations, from  $\frac{1}{9}$  to  $\frac{1}{8}$  of a millimetre in diameter.

2. The greater number of the globules of beer-yeast are well isolated from one another; some, however, have on the side a smaller globule, which is not simply in juxtaposition, but which ap-

FERMENT OF DREGS, (*fermentum faecis*.)

1. Globules most frequently perfectly round; some, however, are ovoid; they are not flattened like those of the blood, but they have a very regular spheroidal form: they greatly resemble the albuminous globules of the brain. The diameter of these globules varies from  $\frac{1}{14}$  to  $\frac{1}{12}$ .

2. Almost all the globules of drags-yeast are isolated; some, however, have on the side a smaller globule, which is not simply in juxtaposition, but which ap-

BLACK FERMENT, (*fermentum nigrum*.)

1. Globules perfectly round; they are not flattened like those of the blood. The dimensions of these globules vary from  $\frac{1}{22}$  to  $\frac{1}{10}$  of a millimetre.

2. All the globules of black yeast are isolated; when they are connected, or when they have on the side small globules annexed, they are transformed, and no

\* I have adopted, as a generic name, the old word *fermentum*. I have not admitted the names of *mycoderma* and *torula*, proposed by M. Demaziere and Turpin, because they apply to a state of ferment in which this modified organized body has no action on a solution of sugar.

## FERMENT OF BEER.

tion, but which appears to proceed from the large globule, and to be still dependant on it; some of the small globules are united to the large by a very evident elongation.

3. Color of the mass, uniformly whitish grey; each globule has granular contents.

4. Insoluble in pure water; insoluble in water containing  $\frac{1}{1000}$  of hydrochloric acid; soluble in concentrated hydrochloric acid, which assumes a beautiful violet color. In great part soluble in water containing 0.001 of hydrochloric acid, after having been bruised for a long time with grains of silica.

5. Ether removes from it 0.05 of a liquid fatty body, containing oleine, stearine, and an oil which contains phosphorus among its elements.

6. Alcohol removes from it lactic and phosphoric acids, and extractive matters.

7. Composition:—Albuminous substances, but containing more oxygen, and containing, also, sulphur and phosphorus.

## FERMENT OF DREGS.

appears to proceed from the large globule, and to longer act as alcoholic ferment.

dependant on it.

3. Color of the mass; uniformly whitish-grey; each globule incloses lobulous contents.

4. *Idem.*

5. *Idem.*

6. *Idem.*

7. *Idem.*

## BLACK FERMENT.

3. Examined with the microscope, the globule presents a very distinct black circle. The color of the mass is uniformly blackish-grey.—No granular contents are distinguished in each globule.

4. *Idem.*

5. Ether removes from it 0.003 of a liquid fatty matter, containing oleine and stearine, and an oil containing phosphorus.

6. *Idem.*

7. *Idem.*

FERMENT OF BEER.	FERMENT OF DREGS.	BLACK FERMENT.
8. Essential properties :—Placed in a solution of sugar, at a temperature varying between 50° and 84° F., determines a brisk fermentation, which terminates in a few days, not being able to be exerted in liquors, containing much alcohol. Is destroyed in the act of brisk fermentation.	8. Placed in a solution of sugar, at a temperature of from 50° to 54° F., determines a slow fermentation, which is complete only after 3 or 4 months ; it acts in liquors containing 16 per cent. of alcohol. Is not sensibly destroyed in the act of slow fermentation.	8. Placed in a solution of sugar, at a temperature of from 50° to 54° F., determines a slow fermentation, which is complete only after 6 months ; it acts in liquors containing more than 17 per cent. of alcohol. Is not sensibly destroyed in the act of slow fermentation.
9. Collected in ordinary beer.	9. Collected in very strong beer.	9. Collected in a deposit of white wine.

The facts contained in this table, says M. Bouchardat, show that these alcoholic ferments differ from each other ; firstly, in form, color, and dimensions, and in the contents of the globules; secondly, by the mode in which they decompose sugar ; thirdly, by the medium in which they exist.

I designate them by the names of *beer-yeast*, *dregs-yeast*, and *black yeast*.

Dregs-yeast and black yeast are especially remarkable, because, by aid of a slow fermentation, they can determine the formation of richer alcoholic liquors than most generous wines. In order to acquire information concerning the nature of ferments, I studied their proximate and elementary composition, and the action on these globules of water containing  $\frac{1}{100}$  of hydrochloric acid.

#### *Proximate Composition of Alcoholic Ferments.*

The following is a list of the substances which enter into the composition of ferments :—

1. Proteic animal matter, insoluble in alcohol, containing nitrogen, hydrogen, carbon, oxygen, sulphur, and phosphorus.

2. Nitrogenous matter, soluble in alcohol.
3. Solid fat.
4. Liquid phosphuretted fat.
5. Lactic acid, lactate of lime and soda.
6. Acid phosphate of lime, and acid phosphate of soda.

*Elementary Composition.*

The proteic animal substance, which forms the essential part of the ferment, differs from casein, albumen, and fibrin by an excess of oxygen, which is not less than 2 per cent.

*Action of Hydrochloric Acid at 0.001.*

Water containing  $\frac{1}{1000}$  of hydrochloric acid dissolves with facility, as I have shown, albumen, casein, &c.; the alcoholic ferments completely resist this solvent action: they are partially dissolved in it when the globules are torn by pulverization: these experiments prove to us that the proteic matters of the globules of the ferment are constituted of two different substances: the one enclosed, soluble in acidulated water; the other enveloping, insoluble in that solvent.

I will describe an experiment which shows us the analogy of ferments with the globules of animals.

*Action of the brain of an adult man on a solution of sugar.*

I took 25 grammes of the brain of an adult man, and put it into a quart of water, and added to it 250 grammes of sugar. After 48 hours, the temperature being about  $77^{\circ}$  F., the alcoholic fermentation commenced, and continued to progress regularly.

At first sight, one would be tempted to perceive here only a fact analogous to those noticed by M. Colin. This chemist, indeed, proved that the albumen of the egg, and several other organic matters, might become alcoholic ferments. But this is the difference between M. Colin's re-

sults and mine: albumen, put in contact with a solution of sugar, at the temperature of  $92^{\circ}$  F., is converted into a ferment, whose action is very weak at the end of three weeks; whilst the cerebral mass of an adult acts, at the end of 48 hours, as an energetic alcoholic ferment.

The substance which composes the brain is formed by the union of globules of different kinds. Among these the most important are the albuminous globules, which present the microscopic appearance of the ferment of dregs, and which act like it on the solution of sugar; these globules are not constituted of pure albumen, as has hitherto been thought. Indeed, if we treat the cerebral mass of an adult with water acidulated with 0.001 of hydrochloric acid, this pretended albumen is not dissolved; to dissolve it, it is necessary previously to bruise it with silica. These experiments show us that the proteic globules of the brain are formed, like the globules of ferment, of an envelope insoluble in acidulated water, and of an enclosed albuminous matter, soluble in that vehicle.

If, instead of taking the cerebral mass of an adult animal, that of a newly-born animal be selected, if it be put into a solution of sugar, and if the mixture be exposed to a temperature of  $77^{\circ}$  F., alcoholic fermentation does not take place, but the mucous transformation is observed.

The reason of this difference is very simple. The envelopes of the brain of a young animal have not sufficient resistance, they are destroyed by endosmose in the solution of sugar, and, the globules no longer existing, alcoholic fermentation cannot take place.

#### *Nature of the globules of alcoholic ferments.*

The globules of alcoholic ferments present the most complete analogy with the nervous globules of superior animals. When, in definite conditions, these vegetables ramify and are transformed into vegetable infusoria, they lose their characters as ferments; the spores themselves of these new

vegetables do not possess the property of decomposing the solution of sugar.

*Experiment on the development of the globules of alcoholic ferment.*

I dissolved the whites of 4 eggs and 1 kilogramme of sugar in 4 quarts of water, containing 0.001 of hydrochloric acid. The liquors were filtered with the greatest care, and divided into two equal flasks. I added nothing to the first flask, and, after two months, the temperature varying from 59° to 77° F., alcoholic fermentation had not manifested itself. To the second flask I added an equally limpid solution of 10 grains of tannin in 100 grammes of water. An abundant precipitate was immediately formed, which, after 49 hours' exposure to a temperature of 77° F., was partly converted into globules of  $\frac{1}{40}$  of a millimetre, acting absolutely with a solution of sugar like the ferment of *dregs*.

*On the multiplication of the globules of ferment.*

All chemists know, since the experiments of M. Thénard, that when a solution of sugar is fermented with a sufficient quantity of globules of ferment, when the first fermentation is accomplished, the weight of the globules is considerably diminished. After a second fermentation they almost entirely disappear, and are replaced by an ammoniacal salt which is found in the liquid, and by the remains of microscopic vegetables, in which M. Thénard recognized the existence of ligneous matter; but this observation can be invoked only to establish the non-production of the globules of the ferment. It may be said that these globules require two kinds of nourishment: sugar, to produce heat by its dédoublement, and nitrogenous matter, to furnish the elements adapted for their assimilation and reproduction. The following is the reply offered by experiment to this latter supposition:—

I took 1 kilogramme of sugar, 4 quarts of water, 50

grammes of yeast, and 200 grammes of white of egg dissolved in water by means of 0.001 of hydrochloric acid. The temperature being maintained at 68° F., the fermentation was promptly established, and continued to proceed with regularity for four days; being then slower, I collected the ferment, and I found its weight to be only 50 gr. .5. There is beyond that a multiplication of 1 to 7 observed in the brewer's vat. The globules of ferment cannot, in any way, assimilate the albuminous matter, any more than the sugar. On the other hand, I have repeated the above experiment by substituting for the 200 grs. of albumen 100 grs. of fresh gluten, also dissolved in water acidulated with 0.001 of hydrochloric acid. I employed also 50 grs. of yeast. The fermentation proceeded regularly for four days. The ferment collected at this time did not weigh more than 49 gr. .2. It is evident that the globules of the ferment do not assimilate more of the solution of sugar than the solutions of albumen and gluten. Does it not follow from these experiments that if we find in the brewer's vat 7 of ferment, only one having been put in; this must be owing only to this 1 part of ferment having met with proteic substances, which, placed in a fermenting medium, are proper for giving rise spontaneously to globules of ferment; the same as in the must of grape, without having added ferment, we find a considerable quantity of it?

*Ibid, from Comptes Rendus.*

## ART. L.—ON SAGAPENUM AND ELEMI. By A. J. COOLEY.

*Sagapenum.*

This substance is described in the London Pharmacopœia as a gum resin, the production of an uncertain species of ferula. Willdenow, Sprengel, and Féé considered it to be the produce of the *Ferula persica*, but this opinion appears to be unsupported by any direct evidence, (Pereira,) and up to the present time, the question is quite as unanswerable as it was 2,000 years ago. What renders this ignorance the more singular is the fact that sagapenum is not a medicine of yesterday, but was known to antiquity. Hippocrates, who died B. C. 361, as well as Dioscorides, mention this substance; and the latter even asserts that it is the liquid produce of a ferula growing in Media. Pliny, the Roman naturalist, also mentioned “*SACOPENIUM*” nearly 1,800 years ago.

The sagapenum of commerce is either met with under the form of agglutinated tears of a yellowish-brown color, or in tough irregular masses. It possesses an odor and appearance intermediate between assafœtida and galbanum. When heated it evolves a peculiar smell, partaking of garlic and juniper, which is neither so powerful nor disagreeable as that of the foetid gum. According to the analyses of Pelletier and Brandes, it consists of:—

	Pelletier.	Brandes.
Resin, soluble in alcohol, and partly soluble in ether,	54.26	50.29
Gum,	31.94	
Do. with calcareous salts,		32.72
Volatile oil, of a yellow color, lighter than water, smelling strongly of assafœtida, and soluble in ether and alcohol,	7.20	3.73
Bassorin,	1.00	4.48
Malate of lime,		
Phosphate of do., &c.	{ 1.00	1.12
Loss, (water,) -	4.60	4.60
Foreign matter,		4.30
	100.00	101.24

This gum is only employed in three preparations to my knowledge, and those are, the pilulæ sagapeni co., the pilulæ galbani co., and the conserva rutæ, or confessio rutæ, of the London and Dublin Pharmacopæias. It is seldom administered alone, but when it is, the dose varies from 5 grains to half a drachm. In the first of the above preparations, it forms  $\frac{1}{7}$ ths of the dry ingredients, in the pil. galbani co. (P. L.)  $\frac{1}{4}$ , and in the confessio rutæ  $\frac{2}{3}$ . It is therefore evident that the attention of the dispenser should be directed to the purity of a medicine administered in such large quantities. It is a painful fact, however, that the mass of the sagapenum sold to the retail trader is factitious, and formed by mixing together assafœtida, galbanum, and other drugs in variable proportions. This is generally done by the conscientious druggists, by softening a mixture of 3 parts of assafœtida and fourteen parts of galbanum, in a water or steam-bath, and then stirring in about  $\frac{1}{7}$ th of their weight of turpentine, to which a little oil of juniper has been added. This mixture is called "gummi sagapeni Opt.," an inferior sort being made by adding sundry portions of yellow resin and paste of gum tragacanth to the above. So much for the honesty of men who, for the sake of a small additional profit, at once trifle with the health and pick the pockets of those who confide in them. It is a painful fact, but too true and too palpable to be denied, that much of the skill and exertions of the faculty are neutralized by the inferior quality of the drugs and preparations which are employed in dispensing their prescriptions. Much of this arises from the cupidity of the retailer inducing him to purchase the lowest priced articles offered him for sale; but a still more fertile cause is his total inability to discriminate one quality from another. The ease with which inferior and often spurious drugs are sold for those of good quality has so encouraged the practice among some unprincipled traders, that they do it with the utmost carelessness, and apparently without the fear of detection. The only certain

remedy against such conduct is the ability to examine and test the quality of drugs and chemicals, and the unflinching use of this valuable qualification before every purchase.

*Elemi.*

This resin, like sagapenum, is the produce of an unascertained tree, respecting which there have been various conjectures. The London and Dublin Colleges assign it to the Amyris elemifera, but the Edinburgh College, with greater discretion, state it to be the "concrete resinous exudation from one or more unascertained plants." Dr. Pereira has suggested that it may be the produce of the Icica icicaribo, the Canarium zephyrinum, or the Canarium balsamiferum, but the question is still undecided.

The elemi of commerce is of a pale yellow color, externally brittle, but soft and tough within; it has a warm bitter taste, and a fragrant aromatic smell, partaking of fennel and juniper. It is only partially transparent, even in thin plates, is very fusible, and has a density a little greater than that of water. According to Bonastre, it consists of 84 per cent. of resin, 12.15 of a fragrant volatile oil, and a little bitter extractive. In medicine it is only employed in the preparation of the unguentum elemi, (P. L.) This substance, like sagapenum, is sometimes adulterated, but more frequently a factitious kind is sold in its place. The latter is formed by adding 1 part of balsam of Canada to 4 parts of yellow resin, previously melted, after which about 1½ per cent. of oil of juniper, and half this quantity of oil of fennel are stirred in. This fraud is readily detected by exposing the suspected article to heat, along with a little water, when its fragrance will evaporate, and the coarse terebinthinate smell and taste of the resin may be readily detected.

*Ibid.*





## MISCELLANY.

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*On Potatoe Oil and the purification of Brandy.—By PROFESSOR DBEREINER.*—It is known that brandy of potatoes, infected with the disagreeable taste to which the name of *fusel* has been given, is much ameliorated, with respect to both taste and odor, when mixed with one-tenth part of its bulk of vinegar and a little sulphuric acid, and distilled after several days.

It was formerly, and still is, believed, that by this process a little acetic ether (acetate of oxide of ethule) is formed, and that this is the cause of the improvement of the brandy. This is an error, for very little or no acetic ether is formed, but, indeed, acetate of oxide of amylool, which has so agreeable a taste and odor of fruit, that it may be employed for perfuming apartments and for the preparation of ratafias of fruits? The readiness with which oxide of amylool combines with acetic acid, is infinitely more considerable than that which oxide of ethule exerts, and does not require, like the latter, the aid of a mineral acid.

The action of chloride of lime on the brandy of fusel, which I discovered more than 36 years ago, has no other origin, since the hydrated oxide of amylool or potatoe oil is metamorphosed by the salt, and thus converted into an ethereal substance of an agreeable taste.

Perfectly calcined wood and animal charcoals separate the potatoe oil completely, in brandy which contains it, only when the liquid has been previously diluted with water, by means of which the force with which the alcohol contains this oil in solution is diminished. In rather concentrated brandy, or alcohol, this oil cannot be separated by any kind of charcoal.

The most simple mode of removing the fusel from brandy, consists in rectifying it in Pistor's disinfecting apparatus. The oil of fusel is thus collected, as a secondary product, in such large quantities that it may be used for the purpose of illumination, on account of its brilliant flame, or for other uses in the arts. I received some time ago several quarts of this oil, from an establishment for the disinfection of brandy at Magdeburg, and I have been enabled to study its properties, principally with relation to the purification of the brandy of

potatoes; the results which I obtained are those above alluded to, and I have also completely convinced myself of the correctness of the opinions of MM. Cahours and Dumas, who regard the fusel of potatoe brandy as analogous to alcohol and pyroxylic spirit.

I will call this oil, on account of this analogy, *amyol*, and will only remark that it acts with finely divided platinum in the same manner as spirit of wine and pyroxylic spirit: thus, when it is put in contact with these liquids, in presence of atmospheric air or oxygen, it absorbs four atoms of this gas, and forms one atom of valerianic acid and three atoms of water.

In a German vinegar manufactory, I remarked, some time ago, a very evident odor of valerianic acid, and I very soon discovered that, for the perparation of vinegar, potatoe brandy, which had not been disinfected, was used. It would certainly be interesting to ascertain whether, in the vinegar-mother liquors, there is not alcohol alone, but, also, potatoe oil or amyol, which might be oxygenised, and whether we might not find, in commerce, vinegars made from alcohol containing valerianic acid. It appears probable that pyroxylic spirit diluted with much water, might be oxidised in these apparatus and converted into formic acid; it is an experiment which I recommend to those who are in a position to make it.—*London Chemist.*

*New Method of detecting the Presence of Sugar in Diabetic Urine.* By DR. CAPPEZUOLI.—This author does not use the blue solution adopted by Frommchters and Taddei (a compound of albumen, potash and oxide of copper), but a few grains of hydrated oxide of copper and a solution of caustic potash in sufficient quantity to render the liquid distinctly alkaline. The operation takes place at ordinary temperatures. The urine is obtained fresh, placed in a cylindrical vessel, either conical or straight, the copper and potash then added, the mixture shaken, and then laid aside. It becomes troubled from the precipitation of the phosphates which were dissolved in it, and from the oxide of copper which it contains in suspension. It gradually however becomes clear, in consequence of the subsidence of a voluminous deposit, which is at first of a sky-blue colour, but at the end of a few hours a canary-yellow circle is perceived to form upon its surface, and usually to pervade the whole mass; subsequently a red colour, more or less deep, in the form of a zone, replaces the yellow, either wholly or in part. This phenomenon, which takes place in 24 hours, is owing to the reaction of the sugar on the oxide of copper. In fact, this base is gradually deprived of its oxygen until the metal is reduced. The sugar, by absorbing oxygen, is transformed principally into formic acid, which combines with the potash. The reac-

tion is rapid when grape-sugar is used, such as that of diabetes. The yellow zone, and the red one which succeeds it, are true characteristics of the presence of sugar in diabetic urine; for they are not produced in the normal state, nor in any other diseased condition of the urine. It might be feared that the presence of sugar of milk in certain urines, might cause the same appearances, because, as is well known, it approaches very nearly to grape-sugar; but such does not occur save when the milk-sugar is in very considerable quantity, and then it requires a much longer time. The same holds good with urines containing the volatile oils of turpentine, copaiba, &c. The author, in acting upon urines to which an addition of honey or grape-sugar has been made, has constantly obtained the red zone, nearly always preceded by the canary-yellow colour. The rapidity with which the reaction occurs, and the brightness of the tints, depend either on the more or less complex composition of the urine or excess of potash or sugar. Moreover, when the phenomenon is not produced within 24 hours, the addition of a little potash causes it to appear.—*Journ. de Pharm., from Gaz. Toscane.*

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*Pills of Extract of Aloes.*—Extract of aloes readily absorbs moisture from the atmosphere, which renders it difficult to preserve in the form of pills. This inconvenience may be perfectly avoided, according to Mr. Röttcher, by adding a fourth part of carbonate of magnesia.—*The Chemist, from Archiv. der Pharm.*

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*Precipitation of Morphia from Tincture of Opium by Ammonia.*—As is well known, tincture of opium and *Liq. Ammoniæ anisatus* are frequently prescribed in combination. M. Reinsch observed, that such a mixture after standing twenty-four hours, deposited morphia in the crystalline form; this may be prevented by the addition of alcohol.—*Ibid., from Jahrb. für Prakt. Chem.*

[The carbonate of the aromatic spirit of ammonia, which is more frequently ordered in this country, produces the same decomposition.—*Ed. Chem. Gaz.*] 

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*Extractum Taraxaci.*—Dr. Bley, who has made some comparative experiments on this extract, states that he obtained in the spring, from 32 lbs. of fresh root with green parts, by pressure 10 oz., by infusion 18 oz., by decoction 19 oz. of extract; in autumn, from fresh roots with the green parts, by infusion 37 oz.; and from 13 1-2 lbs. of dry roots (equal to 40 lbs. of fresh,) by infusion 38 oz. of extract. The extracts

potatoes; the results which I obtained are those above alluded to, and I have also completely convinced myself of the correctness of the opinions of MM. Cahours and Dumas, who regard the fusel of potatoe brandy as analogous to alcohol and pyroxylic spirit.

I will call this oil, on account of this analogy, *amylol*, and will only remark that it acts with finely divided platinum in the same manner as spirit of wine and pyroxylic spirit: thus, when it is put in contact with these liquids, in presence of atmospheric air or oxygen, it absorbs four atoms of this gas, and forms one atom of valerianic acid and three atoms of water.

In a German vinegar manufactory, I remarked, some time ago, a very evident odor of valerianic acid, and I very soon discovered that, for the perparation of vinegar, potatoe brandy, which had not been disinfected, was used. It would certainly be interesting to ascertain whether, in the vinegar-mother liquors, there is not alcohol alone, but, also, potatoe oil or amylol, which might be oxygenised, and whether we might not find, in commerce, vinegars made from alcohol containing valerianic acid. It appears probable that pyroxylic spirit diluted with much water, might be oxidised in these apparatus and converted into formic acid; it is an experiment which I recommend to those who are in a position to make it.—*London Chemist.*

*New Method of detecting the Presence of Sugar in Diabetic Urine.* By DR. CAPPEZUOLI.—This author does not use the blue solution adopted by Frommchers and Taddei (a compound of albumen, potash and oxide of copper), but a few grains of hydrated oxide of copper and a solution of caustic potash in sufficient quantity to render the liquid distinctly alkaline. The operation takes place at ordinary temperatures. The urine is obtained fresh, placed in a cylindrical vessel, either conical or straight, the copper and potash then added, the mixture shaken, and then laid aside. It becomes troubled from the precipitation of the phosphates which were dissolved in it, and from the oxide of copper which it contains in suspension. It gradually however becomes clear, in consequence of the subsidence of a voluminous deposit, which is at first of a sky-blue colour, but at the end of a few hours a canary-yellow circle is perceived to form upon its surface, and usually to pervade the whole mass; subsequently a red colour, more or less deep, in the form of a zone, replaces the yellow, either wholly or in part. This phenomenon, which takes place in 24 hours, is owing to the reaction of the sugar on the oxide of copper. In fact, this base is gradually deprived of its oxygen until the metal is reduced. The sugar, by absorbing oxygen, is transformed principally into formic acid, which combines with the potash. The reac-

tion is rapid when grape-sugar is used, such as that of diabetes. The yellow zone, and the red one which succeeds it, are true characteristics of the presence of sugar in diabetic urine; for they are not produced in the normal state, nor in any other diseased condition of the urine. It might be feared that the presence of sugar or milk in certain urines, might cause the same appearances, because, as is well known, it approaches very nearly to grape-sugar; but such does not occur save when the milk-sugar is in very considerable quantity, and then it requires a much longer time. The same holds good with urines containing the volatile oils of turpentine, copaiba, &c. The author, in acting upon urines to which an addition of honey or grape-sugar has been made, has constantly obtained the red zone, nearly always preceded by the canary-yellow colour. The rapidity with which the reaction occurs, and the brightness of the tints, depend either on the more or less complex composition of the urine or excess of potash or sugar. Moreover, when the phenomenon is not produced within 24 hours, the addition of a little potash causes it to appear.—*Journ. de Pharm., from Gaz. Toscane.*

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*Pills of Extract of Aloes.*—Extract of aloes readily absorbs moisture from the atmosphere, which renders it difficult to preserve in the form of pills. This inconvenience may be perfectly avoided, according to Mr. Röttcher, by adding a fourth part of carbonate of magnesia.—*The Chemist, from Archiv. der Pharm.*

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*Precipitation of Morphia from Tincture of Opium by Ammonia.*—As is well known, tincture of opium and *Liq. Ammoniz anisatus* are frequently prescribed in combination. M. Reinsch observed, that such a mixture after standing twenty-four hours, deposited morphia in the crystalline form; this may be prevented by the addition of alcohol.—*Ibid, from Jahrb. für Frakt. Chem.*

[The carbonate of the aromatic spirit of ammonia, which is more frequently ordered in this country, produces the same decomposition.—*Ed. Chem. Gaz.*]

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*Extractum Taraxaci.*—Dr. Bley, who has made some comparative experiments on this extract, states that he obtained in the spring, from 32 lbs. of fresh root with green parts, by pressure 10 oz., by infusion 18 oz., by decoction 19 oz. of extract; in autumn, from fresh roots with the green parts, by infusion 37 oz.; and from 13 1-2 lbs. of dry roots (equal to 40 lbs. of fresh,) by infusion 38 oz. of extract. The extracts

prepared in the spring were all brown, of the peculiar odour and bitter saline taste; the extracts prepared in the autumn were, on the contrary yellowish-brown, and possessed a sweetish odour and taste. On solution in water, the extracts prepared in spring deposited much less insoluble than those made in autumn. The extract obtained by pressure is most active, but it is also the dearest; the infusion, over which the decoction has no advantage, is preferred. Perhaps it would be best first to express the plant, then to infuse the residue in a little hot water for a few hours, to express again and proceed as usual.—*Ibid, from Archiv der Pharm.*

*Heusler's Charta Vesicatoria.*—Yellow wax, 3*iss*; oil of cantharides, 3*j*; spermaceti, 3*vj*; larch turpentine, 3*ij*, are melted together, and the mass when nearly cold is spread upon paper with a spatula. The following plaster, likewise spread on paper, is recommended for confining it to the intended place:—Lead plaster, 3*vj*; purified rosin, yellow wax, olive oil, of each 3*ij*; turpentine, 3*v*. Mix.—*The Chemist, Jahrb. für Prakt. Pharm.*

*Observations on Balsam, Copava.* By J. E. SIMON.—The genuineness of copaiva balsam is frequently tested by mixing 3 parts of balsam with one of caustic ammonia of 0.96 spec. grav. If the mixture is rendered clear by shaking, the balsam is usually considered genuine. If to this balsam the sixth part of oil of juniper-wood be added, it behaves towards ammonia precisely like the genuine, likewise affording a clear combination, which proves the insufficiency of this test.

Of late there has frequently occurred in commerce a balsam which will not bear the above test with ammonia. I have taken much trouble to detect any adulteration in this balsam, but am thoroughly convinced that it is perfectly genuine. It contains from 20 to 25 per cent, more essential oil, which renders it more liquid, but the oils from both kinds of balsam are identical in odour and in all other properties; the residuous resin in both kinds becomes equally hard and brittle, which entirely does away with the supposition of its having been adulterated with any fat oil. The two resins however differ, the one affording a soapy combination with caustic alkalies, which the resin of the new balsam does not.

Whether this new balsam is obtained from younger trees, or whether it is derived from a different species; whether the one is more active than the other, it is impossible for me to say; but the latter is decidedly not adulterated, for on boiling with water not the least foreign odour is perceptible, and the residue, after boiling and driving off the volatile oil, is hard and brittle like sealing wax.—*Chem. from Archiv. der Pharm.*

*Analysis of Galls.* By GUIBOURT.—Galls contain, according to the author, the following constituents which pre-exist in them :—

Water, 11.5; woody fibre, 10.5; tannine, 65 : gallic acid, 2. Ellagic acid and luteo-gallic acid, 2. Brown extractive substance, 2.5. Gum, 2.5. Starch, 2. Chlorophylle and volatile oil, 0.7 ; sugar, 1.3 ; albumen and salts.

The author assigns the name of luteo-gallic acid to the yellow colouring principle of the galls. It may be separated from ellagic acid by dissolving the two in potash and exposing the solution to the atmosphere ; ellagate of potash is deposited in proportion as carbonic acid is absorbed from the air, while the luteo-gallate of potash remains in solution.—*Ibid, from Ann. der Chem. und Pharm.*

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*Decomposition of the Golden Sulphuret of Antimony by Light.*—M. Ingenohl has observed, that carefully prepared golden sulphuret, which has been quickly dried in a shady place, keeps for a long time in dark vessels undecomposed, but becomes paler when exposed to light, and then yields on analysis an amount of oxide of antimony and sulphuric acid. Wackenroder confirms this observation, and likewise that of Otto, that the precipitated golden sulphuret always contains an amount of oxide when dried by exposure to the air. The preparation precipitated from the sulphuret of antimony and sodium does not undergo so remarkable a decomposition by light.—*Ibid, from Ibid.*

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*On the occurrence of Mannite in the Laminaria saccharina, and other sea weeds.* By JOHN STENHOUSE, Ph.D.—After reviewing the experiments and published reports of various authors, Dr. Stenhouse proceeds to detail the examination of a great variety of sea-weeds ; out of eight different species examined, mannite was separated, and in the case of the *Laminaria saccharina* amounting to 12.15 per cent. The method of separation consisted in digesting the dried extract by hot water, with boiling alcohol, and allowing the mannite to crystallize out by cooling ; as thus obtained its composition was  $C^6 H^7 O^8$ . Mannite may be distinguished from cane-sugar by its not being discoloured from the action of strong sulphuric acid and a gentle heat ; and from grape-sugar by boiling with strong solution of caustic potash or soda, the mannite dissolving without change of colour. When heated with solution of potash and sulphate of copper, it does not precipitate the red oxide of copper, as is the case with grape-sugar.

Dr. Stenhouse could not detect mannite in the Couch-grass, as stated by Prof. Pfaff, but obtained crystals of binoxalate of potash, which appear to have been mistaken for the former substance.—*Chem. Gaz.*

*Antiperiodic Ointment.*

R—Lard,	- - - - -	95 gr.
Sulphate of quinine,	- - - - -	15 gr.
Sesquioxide of iron,	- - - - -	60 centi-gr.
Pure opium,	- - - - -	15 "

**USE.**—In frictions on the vertebral region, after having washed it with soap and water, every two hours for three days.

This ointment is employed in cases of periodic fevers—when children are indisposed for absorption—when the fits do not allow time for administering the preparations of quinine—when there is vomiting and dysphagia, &c.—*Chemist from Journal de Chimie Médicale.*

**Arsenic in the Earth of Cemeteries.**—M. OLLIVIER D'ANGERS made the following communication to the Academy:—He had recently been engaged in a judicial inquiry which had involved an important medico-legal question, one on which M. Orfila had read a paper to the academy two years ago, viz., "the arsenic contained in the earth of cemeteries." M. Orfila stated in his memoir that arsenic being insoluble in water, it was impossible that a body buried in arsenical ground could become impregnated by that substance. This statement, the result of theory, had been confirmed by the case to which he alluded, and which was as follows:—A man lost his wife, and public rumor having accused him of poisoning her, the body was exhumed. An accurate analysis, however, proved that she had died of organic lesions quite independent of the action of any poison. A married woman, who wished to marry this man, poisoned her husband, and on the *post mortem* examination being made, evident traces of arsenic were found. The woman was brought before the assizes, but owing to discussions between the medical witnesses, the trial was deferred to the ensuing session. The body of the poisoned man was again exhumed, and the viscera sent to Paris to M. Ollivier d'Angers, along with some of the earth of the grave. Arsenic was found in the liver through the means of Marsh's apparatus. It was also found in the earth. The authorities then had the body of the woman who first died again exhumed. It is worthy of remark that after the first exhumation the body accidentally fell out of the coffin into the grave, and was covered by arsenical earth. Not a trace of arsenic however was found in the body, although it had thus remained several months imbedded in arsenical earth. This case, therefore, confirms the previsions of M. Orfila. It shows both that arsenic does exist in the earth in some localities, and that this circumstance does not render medico-legal researches more difficult, as the insolubility of the arsenic contained in the earth of cemeteries prevents bodies becoming impregnated with it.

On M. Roux asking what was the cause of the presence of arsenic in cemeteries, M. Ollivier referred him to M. Chevalier, who had written an important memoir on the subject.

M. Chevalier stated that in the department of the Vosges, where the fact mentioned by M. Ollivier had occurred, there are many mines of arsenic. The presence of arsenic in the ground of the cemetery is, therefore, to be attributed, probably, to the geological constitution of the soil. This is not the case with the ground of the Parisian cemeteries. A fact with which he had only recently become acquainted, confirmed M. Orfila's views. All the bones of the work-people of a small town in which copper is wrought, found in the cemetery, contain copper; but copper is also found in the ground in which they lie. In order to ascertain whether the copper was primitively contained in the bones, or whether it was communicated from the soil, he sent for bones from other localities where copper is wrought, but where the earth does not contain that metal; he found that they were likewise impregnated with the metal.

M. Orfila recalled to the recollection of the Academy that in his memoir he had proposed two questions: first—Can a body impart to the earth the arsenic it contains? Secondly—Can earth, containing arsenic, poison, as it were, a body? The first question he then answered affirmatively, the second negatively. The fact related by M. Ollivier d' Angers proved that the results at which he had arrived were correct.—*Chemist.*

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*Formulae for some Trochisci.* By M. SCHMITZ.

*Trochisci Althææ.*—R. Rad. Alth. Pulv.  $\frac{3}{4}$ ij.; Rad. Glycyrrhiz.  $\frac{3}{8}$ ss.; Rad. Iridis  $\frac{3}{4}$ j.; Sacch. Albi. lbij.; Mucil. Tragac. q. s.

*Trochisci Beechii* (according to Vignier.)—R. Succ. Glycyrrh. Pulv.  $\frac{3}{2}$ xx.; P. Gum. Acaciæ  $\frac{3}{4}$ v.; P. Sacch. Alb.  $\frac{3}{2}$ xx.; Opii pulver. gr. lxxxiv.

Mix with about 10 oz. of water to form a mass, from 6 drms. of which thirty lozenges are to be made.

*Trochisci Catechu.*—R. P. Catechu  $\frac{3}{4}$ vj.; Rad. Iridis  $\frac{3}{4}$ ij.; P. Sacch. Alb.  $\frac{3}{4}$ ij.; Ol. Rosar.  $\frac{3}{4}$ iv.; Mucil. Tragac. q. s.

Either 2-grain pills or small lozenges are to be made from this, and sprinkled with powdered violet-root. The oil of roses may be replaced by oil of cloves, cinnamon or peppermint.

*Trochisci Gummi.*—R. P. Acaciæ Gum. Sacch. Albi aa,  $\frac{3}{4}$ iv.; Aq. Rose  $\frac{3}{4}$ x.

The latter may be replaced by 4 drops of oil of roses and water, or by orange-flower water. It is best not to mix up more of this than the quantity stated, because the gum very quickly becomes dry.

*Trochisci Ipecacuanha.*—R. P. Rad. Ipec. ʒx.; Sacch. Alb. ʒxxiv.; P. Catechu ʒss.; Mucil. Tragac. q. s.

An ounce of these lozenges contains 30 grs. of Ipecacuanha, and each one weighing 5 grs.  $\frac{1}{2}$  gr. of the root.

*Trochisci Rhei.*—R. P. Rhei ʒss.; Sacch. Alb. ʒvss.; Ol. Menth. Pip. m̄xij.; Aq. Menthæ Pip. q. s.

*Trochisci Strumales.*—R. Sacch. gross. pulv. ʒxxx.; Aq. Rosæ ʒiv.; ad consist. Trochiscor. coque, et ab igne remove, deinde addit. pulv. sequent. ʒiij. + ʒvj.:—

R. Spongiae ustæ ʒiv.; Oss. Sepiæ, Lapid. Spongiae aa ʒij.; Nuc. Gal-  
lar., Cinnam. ft. ʒj.; M. P. Pulv. subtiliss. Fiant Trochisci se-  
cund. artem.

*Trochisciæ Vichy.*—R. P. Soda Bicarb. ʒxvj.; Sacch. Albiss. ʒvj.; Mucil. e Tragac. pulv. ʒss.; Aq. Comm. ʒxj. ut ft. Trochisci.

The most various recipes exist for these lozenges. The above is said to have been deduced from the analysis of true *Tablettes de Vichy*. They are rendered aromatic by the addition of balsam of Tolu, oil of pepper-  
mini, (g. vi.) and mixing with orange-flower water.

*Trochisci effervescentes.*—

Troch. Acid.

Troch. Alkalini.

R. P. Acid. Citrie. ʒiv.

R. P. Soda Bicarb. ʒiv.

Sacch. Albi. ʒvij.

Sacch. Albi. ʒvij.

Ol. Citr. m̄xij.

Muc. Trag. q. s.

Mucil. Trag. q. s.

The acid lozenges become moist, and must therefore be preserved in stoppered bottles.

*Trochisci Cinchonæ*—R. Extr. Cinch. flav. ʒiv.; P. Cort. Cinch. ʒvij.; P. Sacch. Alb. lbj.; Aq. fount. ʒvj.—*Chem. Gaz.*, from *Archiv der Pharm.*